Exhibit 6

THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of:	Anton Monk et al.	
U.S. Patent No.:	8,621,539 B1	Attorney Docket No.: 45035-0032IP1
Issue Date:	December 31, 2013	
Appl. Serial No.:	11/241,748	
Filing Date:	September 29, 2005	
Title:	PHYSICAL LAYER TRANSMITTER FOR USE IN A BROADBAND LOCAL AREA NETWORK	

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PETITION FOR *INTER PARTES* REVIEW OF UNITED STATES PATENT NO. 8,621,539 PURSUANT TO 35 U.S.C. §§ 311–319, 37 C.F.R. § 42

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LISTING OF CLAIMS

Claim 1	
[1pre]	A modem for communication to at least one node across at least one channel of a coaxial network, the modem comprising:
[1a]	a transmitter; and
[1b]	a MAC layer in signal communication with the transmitter, the MAC layer using at least one probe packet as an echo profile probe to measure node delay spread on the network and the MAC layer optimizing the preamble and cyclic prefix requirements or other parameters in response to the measured node delay spread on the network;
[1c]	wherein the transmitter communicates the at least one probe packet.[1]
Claim 2	
[2]	The modem of claim 1 wherein the one probe packet has a payload, and the payload includes pseudo random time domain samples generated by a pseudo random sequence.

[1] Element [1c] originally read: "wherein the transmitter communicates the at least one transmit packet." DISH-1001, 18:24-25. The 07/15/2014 Certificate of Correction changed "transmit packet" to "probe packet." *Id.*, p. 37.

Claim 3	
[3]	The modem of claim 2 wherein the payload is transmitted with a binary phase shift keying (BPSK) modulated single carrier at the center frequency of the channel.
Claim 4	
[4]	The modem of claim 3 wherein a length of the one probe packet is provided by the MAC layer.
Claim 5	
[5]	The modem of claim 1 wherein the one probe packet has a payload, and the payload consists of pseudo random time domain samples generated by a pseudo random sequence.
Claim 6	
[6]	The modem of claim 5 wherein the payload is transmitted with a binary phase shift keying (BPSK) modulated single carrier at the center frequency of the channel.
Claim 7	
[7]	The modem of claim 6 wherein a length of the one probe packet is provided by the MAC layer.

I. INTRODUCTION

The ’539 patent claims concepts that were known in the art. Before the ’539 patent’s priority date, engineers had improved upon networking architectures by fine-tuning portions of packets transmitted over the network. For example, as the ’539 patent acknowledges, network transmitters and receivers supported various packet types, including probe packets that can be used to calibrate, maintain, and/or optimize network communications. DISH-1001, 9:35-10:11, FIG. 6. The ’539 patent also acknowledges that, because networks often have multiple paths for sending communications, one type of probe packet—the echo profile probe—was used to measure multipath effects resulting from copies of the same transmitted signal arriving at the destination at different times through different paths (i.e., node delay spread). *Id.*, 9:62-65, 14:11-15; DISH-1003, ¶56. The adjustment of transmission parameters—including a packet’s cyclic prefix—was also a known, understood concept in the art. DISH-1003, ¶56-57.

The petition’s prior art establishes that it would have been obvious to have coaxial-network modems measure node delay spread to optimize parameters like preambles and/or cyclic prefixes. For example, Hou discloses a coaxial-network modem taking “performance measurements” of a channel and assigning parameters, including a preamble, based on those measurements. And Konschak teaches it was known to adapt a cyclic prefix based on measured delay spread.

Accordingly, Dish Network L.L.C., Dish Network Service L.L.C., DISH Network Corporation, and DISH Network California Service Corporation, (collectively, "Petitioner" or "DISH") petition for *Inter Partes* Review ("IPR") under 35 U.S.C. §§ 311–319 and 37 C.F.R. § 42 of claims 1-7 ("the Challenged Claims") of the '539 patent.

II. REQUIREMENTS FOR IPR—37 C.F.R. §42.104

A. Grounds for Standing—37 C.F.R. §42.104(a)

Petitioner certifies that the '539 patent is available for IPR and Petitioner is not barred or estopped from requesting this review. The present Petition is filed within one year of service of a complaint against DISH in 2:23-CV-01043 (C.D. Cal.). DISH-1019; DISH-1020; DISH-1021; DISH-1022; DISH-1023.

B. Challenge and Relief Requested—37 C.F.R. §42.104(b)

This Petition demonstrates a reasonable likelihood of prevailing as to at least one Challenged Claim. Petitioner requests institution of IPR and cancellation of all Challenged Claims on the grounds identified below. The expert declaration (DISH-1003) of Dr. Roch Guerin provides complementary explanation and support for each ground.

Ground	Patent Claims	Basis
1	1	§103: Hou-Konschak
2	2-7	§103: Hou-Konschak-Dapper

Each reference pre-dates 2004-12-02 ("Critical Date"), which is the earliest

possible date to which the ’539 patent can claim priority.[2]

Reference	Prior Art Date (at least as early as)[3]	Basis (at least under)
Hou US6,898,755 (DISH-1005)	2001-08-24	§102(e)
Konschak EP1065855 (DISH-1006)	2001-03-01	§102(b)
Dapper US6,366,585 (DISH-1007)	2002-04-02	§102(b)

C. Claim Construction—37 C.F.R. §42.104(b)(3)

Because the Challenged Claims are obvious under any reasonable interpretation, no express constructions are required in this proceeding. *See Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011) (“claim terms need only be construed to resolve a controversy”). To be clear, Petitioner reserves the right to address any construction proposed by Patent Owner or the Board. Petitioner also reserves the right to pursue constructions in district court that are necessary to decide matters of infringement. Petitioner reserves the right to contend in district court that the challenged claims are invalid under 35 U.S.C. ¶ 112.

III. THE ’539 PATENT

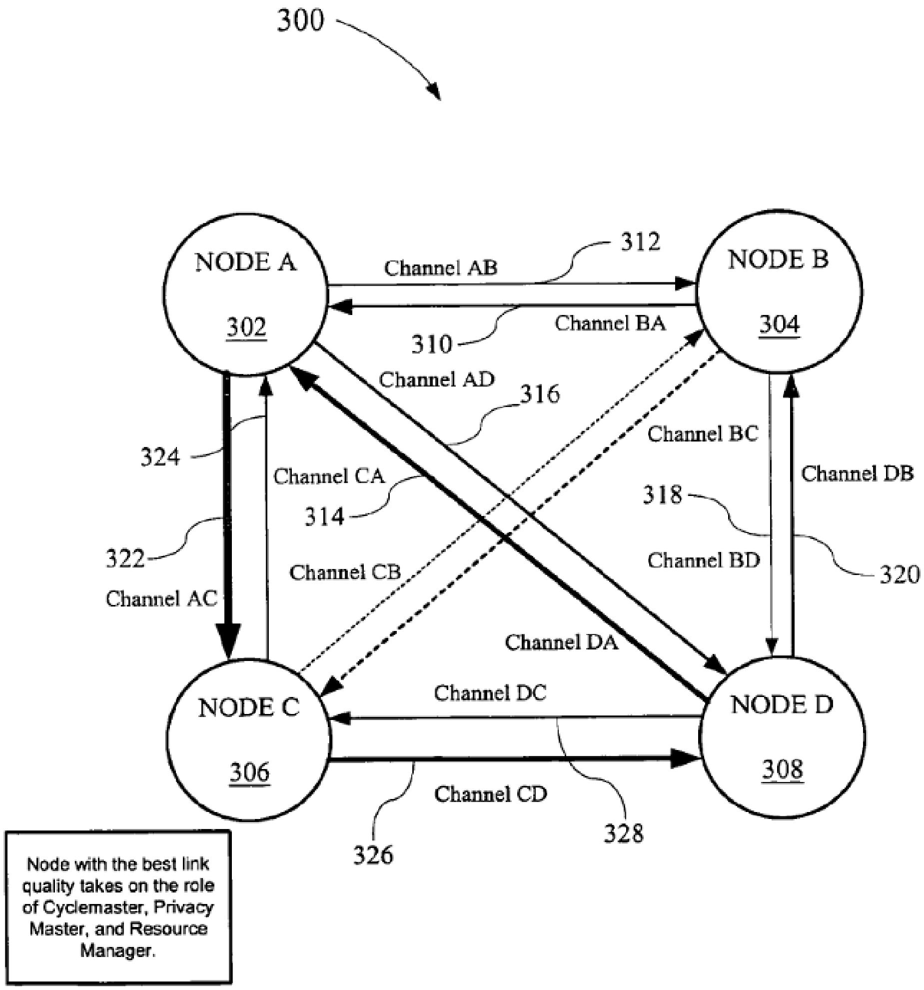
[2] Petitioner does not concede that the ’539 patent is entitled to the claimed priority.

[3] *See* Sections V.A.1-2, V.B.1 for explanations of these dates.

A. Summary

The ’539 patent describes “[a] transmitter (‘PHY Transmitter’) for communicating between a plurality of nodes” in “a broadband cable network (BCN), operating at the physical layer.” DISH-1001, 4:38-42. The specification acknowledges that it was known in the art for a PHY Transmitter to operate in a cable network made up of multiple nodes, or customer premise equipment (“CPEs”), that receives signals from service providers outside the premises via a point-of-entry (“POE”) through a network of coaxial cables and splitters. *Id.*, 1:25-42, 1:57-63. Such broadband cable networks utilizing coaxial cabling and splitters were known in the art, as well as both downstream and upstream communications between the POE and CPE. *Id.*, 1:57-62, 2:4-7, 2:28-53, 4:8-11.

The PHY Transmitter “performs all of the necessary RF, analog and digital processing required for transmitting MAC messages,” enabling two-way communications between the nodes using data packets. *Id.*, 4:42-46, 4:56-5:6. Thus, as illustrated below in Figure 3, a “logical mesh network” 300 is formed between the various nodes in the cable network. *Id.*, 5:8-10, 6:48-51.



DISH-1001, FIG. 3.

In such a network, to account for the possibility of poor signal transmission and/or reception between each pair of nodes, the ’539 patent purports to optimize communications between each node in both directions. *Id.*, 6:52-67. To achieve this optimization, nodes exchange “probe messages,” and those nodes compare the received probe waveform to the known probe waveform to “inform the transmitter of the best modulation format to use for the specific channel.” *Id.*, 7:39-54.

While the ’539 patent specification refers to three types of probe messages,

the type relevant to the challenged claims is the "Echo Profile ('EP') Probe[]" used to "measure node delay spread on the network" to "optimize the preamble and Cyclic Prefix ('CP') requirements or other parameters." *Id.*, 9:53-65. Although the '539 patent does not define what it means to "optimize" a preamble or cyclic prefix, it does describe adjustment of the lengths of the cyclic prefix and preamble in response to measured parameters. *See id.*, 9:62-65, 14:12-16 (describing adjustment to cyclic prefix length), 14:17-28 (describing different-length preamble options).

B. Prosecution History

The '539 patent issued from U.S. Patent Appl. No. 11/241,748, which was filed 9/29/2005 and claims priority to four Provisional Applications, each filed 12/2/2004. A number of originally-filed claims were amended in response to office actions, but the claim that issued as independent claim 1 was originally added as claim 47 on 2/4/2010 in response to an advisory action dated 12/28/2009. DISH-1002, 206.[4] The Applicant argued that the prior art did not teach a MAC layer using a probe packet to measure node delay spread in order to optimize parameters, such as preamble and cyclic prefix requirements. *Id.*, 207-208.

In a 3/29/2010 non-final office action and a subsequent 10/1/2010 final

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[4] Citations to DISH-1002 throughout refer to PDF page numbers.

office action, the Examiner found that three prior art references rendered obvious original claim 47. *Id.*, 228. In response, the Applicant argued that one reference was not prior art and that the cited references did not teach a MAC layer using a probe packet to measure delay spread to optimize the preamble and cyclic prefix requirements or other parameters. *Id.*, 253-254, 312-313.

In response to the continued rejection of the claims in a 2/22/2011 non-final office action, the Applicant argued that the prior art disclosed the use of different cyclic prefixes with different amounts of delay spread, but did not teach a probe packet for measuring such delay spread. *Id.*, 357-358. In response to the continued rejection of the claims in an 8/1/2011 final office action, the Applicant cancelled all remaining claims except original claim 47, and amended claim 47 by adding "the MAC layer optimizing the preamble and cyclic prefix requirements or other parameters in response to the measured node delay spread on the network." *Id.*, 391.

Then, in response to the continued rejection of original claim 47 in a 4/18/2012 non-final office action, the Applicant added claims 48-53 (issued as claims 2-7) and argued that there was no motivation to combine the cited references, and that the prior art teaches using different cyclic prefixes based on "***expected*** delay spread," but not optimizing the preamble, cyclic prefix, or other

parameters "***in response to"*** a ***measured*** delay spread.[5] *Id.*, 420 (emphasis on "expected" and "in response" in original).

Following another rejection, the applicant's remarks, and an advisory action, the applicant submitted an appeal brief on 4/12/2013, arguing that, while "[t]he relationship between cyclic prefix length and multipath delay spread is well understood by those skilled in the art," the prior art did not teach "using at least one probe packet as an echo profile probe to measure node delay spread on the network." *Id.*, 428-437, 446-448, 472. In response, the Examiner issued a Notice of Allowance on 5/31/2013. *Id.*, 484.

C. Level of Ordinary Skill in the Art

For this IPR, a person of ordinary skill in the art ("POSITA") would have had (i) a bachelor-level degree in electrical engineering, computer engineering, or a related field, and three or more years of experience working in signal processing and/or communications systems/networks; (ii) a master's degree in electrical engineering, computer engineering, or a related field, and at least one year of experience in signal processing and/or communications systems/networks; or (iii) a doctoral degree in electrical engineering, computer engineering, or a related field, and at least some experience in signal processing and/or communications

[5] All emphasis added unless otherwise specified.

systems/networks. DISH-1003, ¶16. Additional education could substitute for professional experience, or *vice versa*. *Id.*

IV. THE CHALLENGED CLAIMS ARE UNPATENTABLE

A. GROUND 1: Claim 1 is Rendered Obvious by Hou and Konschak

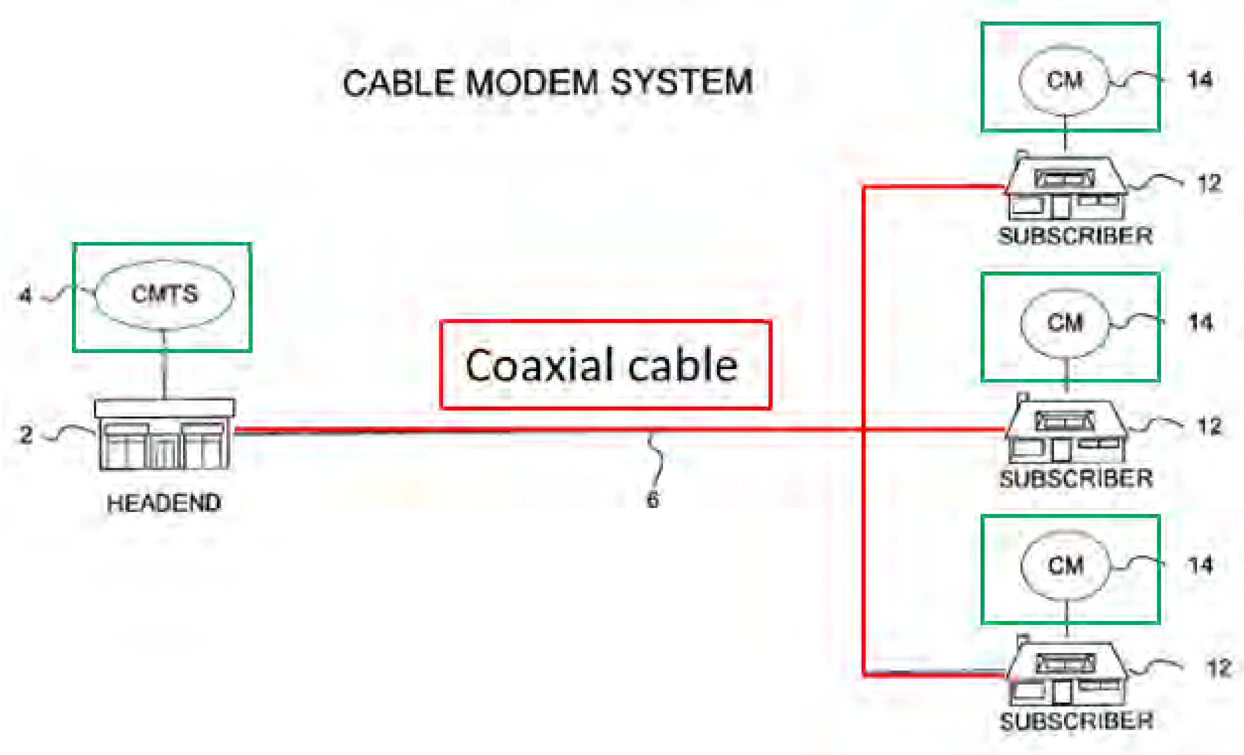
1. Overview of Hou

Hou is entitled "Method for increasing physical layer flexibility in cable modem systems." DISH-1005, Cover. Hou was filed on August 24, 2001 and issued on May 24, 2005. *Id*. Accordingly, Hou qualifies as prior art under at least §102(e).

Like the '539 patent, Hou discloses methods for improving physical layer communications in a cable modem network. *Compare id.*, 6:30-33 ("it is an object of the present invention to provide a method for increasing physical layer flexibility in cable modem systems"); *with* DISH-1001, 4:37-55 ("A transmitter ('PHY Transmitter') for communicating between a plurality of nodes in a multi-mediate network . . . utilizing a broadband cable network ('BCN') operating at the physical layer . . . is disclosed").[6] Hou's cable modem network communicates

[6] PHY is an abbreviation for the physical layer and would have encompassed a circuit that implements the functions known to be performed by a physical layer. DISH-1003, ¶46.

over “coaxial cable, Hybrid Fiber Coax(HFC), or wireless,” and has a headend with a “Cable Modem Termination System” (“CMTS”) that receives and delivers signals over the network to cable modems (“CMs”) at subscriber residences. DISH-1005, 1:21-38. As such, a POSITA would have understood that Hou teaches techniques applicable to any of coaxial cable, HFC, and wireless network mediums. DISH-1003, ¶47. Hou aims to improve the bandwidth usage of the channel between the CM and the CMTS in the network. DISH-1005, Abstract (“The invention described herein is directed to a method and apparatus for increasing the communication channel between the CM and the CMTS”), 6:5-6 (“The system as a whole achieves greater bandwidth efficiency through the exercise of the PHY flexibility”).



DISH-1005, Fig. 1 (PRIOR ART).[7]

Hou recognizes that in such a system, different CMs may be impacted by localized or path-specific impairments, and aims to improve the reliability of those signals. *Id.*, 6:18-27. Hou discloses a system operating according to Data Over Cable Service Interface Specifications ("DOCSIS") where the CMTS uses upstream transmissions from each CM to "determine[] whether the CM is dynamic burst profile mode capable." *Id.*, 6:35-38, 7:15-17. If so, the CMTS assigns a burst profile to the CM based on "performance measurements and the level of

[7] Annotations and color added unless otherwise noted.

robustness needed." *Id.*, 7:21-26. The measurements taken include measurements of "Echo Delay Spread (measurement of Amplitude of echo and its delay)." *Id.*, 13:1-15. The "key parameters that relate to the robustness of the burst profile" include the "length of the preamble." *Id.*, 8:23-27. For example, Hou teaches assigning different burst profiles with different preamble lengths to CMs depending on transmission robustness (i.e., robustness level). *Id.*, 7:43-8:22. "In general, given a CM's performance measurements using any burst profile, the CMTS can decide whether to change its burst profile." *Id.*, 8:59-62.

2. Overview of Konschak

Konschak is entitled "Adaptation of cyclic extensions in an OFDM communication system." DISH-1006, Cover. Konschak published on January 3, 2001, more than a year before the earliest possible priority date of the '539 patent. *Id*. Accordingly, Konschak qualifies as prior art under at least 102(b).

Konschak discloses "determining a delay value representing a channel delay of a transmission channel" between two communication apparatuses in a wireless telecommunications system utilizing OFDM communications. *Id.*, Cover. Konschak aims to optimize the cyclic prefixes used to combat "echoes" caused by "multipath effects," which lead to "the well-known effect of intersymbol interference (ISI)." *Id.*, [0002], [0004], [0007]. Konschak discloses determining the channel delay profile by "comparing a received reference symbol with an

expected reference symbol" to extract "a channel delay profile from the comparison result," and determining the "delay value" based on that result. *Id.*, [0014]. Konschak teaches calculating the "length value of the cyclic extensions" "depending on the delay value." *Id.*, [0015].

3. Hou-Konschak Combination

The Hou-Konschak combination incorporates Konschak's OFDM communications and adaptation of cyclic extensions to account for measured delay profiles into Hou's system. As a result, the adjustment of cyclic prefixes disclosed in Konschak would have been applied to the transmissions in Hou's system to adapt to multipath echo effects in the network based on the delay profile measurements disclosed by Konschak. DISH-1003, ¶¶60-63; DISH-1005, 7:43-8:22, 8:59-62; DISH-1006, [0014], [0015].

A POSITA motivated to improve communications between a CMTS and CM, as described in Hou, would have appreciated that Konschak's calculation of cyclic prefixes based on channel delay measurements would have been advantageous in minimizing transmission overhead when relying on OFDM communications. DISH-1003, ¶64. For example, Konschak recognizes that prior art transmissions utilizing fixed cyclic extension lengths result in sub-optimal transmission overhead, "yielding a reduced user data transmission rate," and teaches methods of reducing the overhead caused by cyclic extensions while

maintaining transmission quality. DISH-1006, [0006], [0007]. A POSITA would have recognized that Hou's system, which assigns burst profiles based on performance measurements to minimize physical layer overhead and increase bandwidth efficiency over cable modem communication channels, would similarly benefit from Konschak's disclosures when Hou's system is extended to utilize OFDM communications. DISH-1003, ¶64-65; DISH-1005, 8:55-65. A POSITA would also have recognized that Konschak discloses measurements in a network utilizing OFDM communications that, like those in Hou, are used to improve bandwidth efficiency, and would have found it obvious to implement such measurements when implementing OFDM communications in Hou. DISH-1003, ¶64-65. As explained further below, a POSITA would thus have been motivated to combine Hou and Konschak for several reasons. *Id*.

(a) The Hou-Konschak System

Hou discloses a coaxial network utilizing modems that use transmissions to measure channel characteristics (including delay spread) and adapt later transmission parameters to those characteristics, including the preamble. *E.g.*, DISH-1005, 7:21-26, 13:1-15. Adjusting the cyclic prefix according to Konschak's teachings would have been a minor and obvious addition once OFDM was incorporated into Hou's system, given the known relationship between delay spread and cyclic prefix. *E.g.*, DISH-1006, [0002], [0004], [0007], [0014]-[0015];

DISH-1002, 428-437, 446-448, 472.

The Hou-Konschak system would have incorporated OFDM communications in Hou's cable modem network. Hou discloses a cable modem system operating in a coaxial cable network, which was known to have multipath effects. *E.g.*, DISH-1010, 4:28-32; DISH-1003, ¶56-57, 67. Incorporating OFDM into Hou's system would have been an effective method of countering such multipath effects. DISH-1010, 4:28-32; DISH-1003, ¶68.

Hou teaches the CMs (the claimed "modem") communicating across the coaxial cable network with the CMTS (the claimed "node"). 3:11-14. 3:42-53, 4:7-12. Each CM would have had a MAC layer constructing and transmitting probe packets used to measure the properties of the channel between the CM and the CMTS, including the delay spread. DISH-1005, 6:37-43, 7:20-26, 8:44-46, 8:59-65, 13:1-18; DISH-1003, ¶¶115-117. Hou discloses a ranging procedure between a CMTS and CM. DISH-1005, 2:58-66, 2:58-3:3, 4:32-42. Ranging procedures were well known in the art, and a POSITA would have understood that Hou's disclosed ranging procedure includes the typical messages that were used in ranging procedures, including RNG-REQ messages sent from the CM to the CMTS used to measure properties of the channel. DISH-1003, ¶¶105-107.

Having incorporated OFDM communications into Hou's system as described above, a POSITA would have added a reference symbol to the RNG-

REQ messages to measure the delay properties of the channel and obtain the benefits disclosed in Konschak—reduction of transmission overhead. DISH-1006, [0002], [0014]; DISH-1003, ¶111-114. As Hou already discloses assigning preamble lengths based on the measured properties, it would have been obvious to also adjust the cyclic prefix (as taught by Konschak). DISH-1005, 7:21-26, 13:1-15, 5:52-6:6, 7:36-8:27, 8:43-65; DISH-1006, [0002], [0009], [0010], [0011], [0014]. [0015]; DISH-1003, ¶¶111-114, 124-125. These probe packets would have been transmitted by the CM using the CM's transmitter, as would other packets transmitted by the CM. DISH-1005, 3:34-36, 1:21-42, 1:45-49, 2:30-41, 3:4-10, 3:34-36, 3:47-53, 3:60-62, 4:22-25, 6:18-22.

(b) Motivation

First, the benefits of OFDM techniques in point-to-multipoint cable network systems like Hou's were known in the art, and a POSITA would have looked to OFDM techniques like those disclosed in Konschak to improve communications in Hou's system. DISH-1003, ¶¶67-68. Indeed, it would have been obvious to use OFDM techniques in point to multipoint networks. DISH-1003, ¶¶67-68. As corroborated by U.S. Patent No. 7,230,909 to Raissinia, it was known that "multipath effects [were] a concern" in point-to-multipoint networks—for example, such as that in Hou. DISH-1010 4:28-32; DISH-1003, ¶¶67-68. Hou itself recognizes multipath effects may be present in its network, disclosing "echo

delay spread" as a measured parameter. DISH-1005, 13:13-34.

It would further have been obvious to a POSITA to use OFDM in Hou's system because OFDM was known as an effective solution to counter multi-path delay spread in communications. DISH-1003, ¶68. For example, U.S. Patent No. 7,433,296 to Tsuie explains that "[o]ne of the group ***main advantages of OFDM*** is its ***effectiveness against the multi-path delay spread*** frequently encountered in mobile communications channels." DISH-1011, 2:15-17. Another reference, U.S. Patent No. 6,654,431 to Barton, similarly explains that "[i]t is well-known in the industry that [OFDM] technology is an ***effective effective means of mitigating Intersymbol Interference (ISI) on multipath fading channels*** . . . in environments where the Root-Mean-Square (RMS) ***delay spread is a significant impairment***." DISH-1012, 1:33-38. Indeed, references like U.S. Patent No. 7,230,909 to Raissinia actually describe use of an OFDM network in a point-to-multipoint network. DISH-1010, Abstract (explaining OFDM is used in Raissinia's system), 1:28-31 (explaining a "data over cable network" is a point to multipoint network"). As such, incorporation of OFDM into Hou's system would simply have involved combining prior art elements according to known methods to yield predictable results.

Additionally, OFDM was also known to obtain efficient utilization of transmission bandwidth, particularly in upstream transmissions in point-to-

multipoint systems like those disclosed in Hou. DISH-1003, ¶68; DISH-1007, 19:43-20:1. A POSITA would thus have been motivated to implement OFDM communications in Hou's network. DISH-1003, ¶67-68.

Second, a POSITA contemplating improving Hou's system with OFDM communications would have been motivated to look to Konschak because both references are directed to solving similar problems in the art using similar methodologies. DISH-1003, ¶69. In particular, both Hou and Konschak are directed to solving the prior art's need for optimized communications in a network to make efficient use of limited resources. For example, Hou recognizes that the number of available burst profiles "limit[s]. . . the system as a whole because the capacity of the upstream channel could be more efficiently utilized," depending on the individual capabilities of the CMs. DISH-1005, 5:52-6:6, 10:18-21, 10:28-30, 10:57-11:3, 12:1-10. Similarly, Konschak recognizes that the use of fixed-length cyclic extensions is inefficient because "in most cases the actual transmission channel exhibits better properties than the worst case channel," and thus the overhead associated with fixed cyclic extensions is "not optimal," and "yield[s] a reduced user data transmission rate." DISH-1006, [0006].

Both Hou and Konschak further provide solutions that improve the efficiency of bandwidth usage by measuring characteristics of a channel and adjusting transmission parameters based on that result. DISH-1005, 6:37-43

(Hou's "CMTS assigns a burst profile based on performance measurements on the CM and grants the CM a number of mini-slots per the burst profile parameters and the CM's request"), 13:1-3 (Hou's "CMTS should be capable of measuring the following counts on a per CM basis in order to determine appropriate burst profiles to assign . . . "); DISH-1006, [0011] (Konschak's techniques "measure the delay properties of the respectively used transmission channel, set a corresponding length value for the cyclic extensions and transmit the length value"). A POSITA would have used Konschak's known technique of cyclic extension adaption to improve Hou's system when implementing OFDM communications, in order to reduce overhead and improve bandwidth usage. DISH-1003, ¶¶70-71. Such a combination would have involved combining prior art elements according to known methods to yield predictable results. DISH-1003, ¶71.

Third, a POSITA seeking to achieve Hou's goal of improving bandwidth usage in a coaxial network would have been motivated to look to Konschak, which acknowledges the disadvantages of fixed-length cyclic extensions in multipath systems and discloses a method to optimize OFDM transmissions by adapting the prefix according to measured delay spread and reducing the overhead in those transmissions. DISH-1003, ¶72; DISH-1005, 5:52-6:6; DISH-1006, [0002], [0005], [0006], [0007], [0011]. Hou discloses the "Echo Delay Spread" as one parameter that the CMTS measures "in order to determine appropriate burst

profiles to assign" to each CM in the network. DISH-1005, 13:1-15. One parameter in the assigned burst profiles is the "guard time," analogous to a cyclic prefix used to eliminate inter-symbol interference resulting from delay spread. DISH-1003, ¶73; DISH-1005, 7:40-8:22; *see also* DISH-1014, 1:63-66. While Hou does not specify using variable-length guard times, a POSITA would have known that using fixed, worst-case values for guard times resulted in wasted resources, similar to the effects of using fixed-length cyclic extensions as known in the art. DISH-1003, ¶74; DISH-1006, [0005] ("In known OFDM-systems, the length of a cyclic extension is fixed and chosen to be longer than the maximum possible excess delay of a typical transmission channel").

A POSITA implementing OFDM communications into Hou's system would have expected Konschak's teachings regarding adaptation of cyclic extensions based on measured multipath delay effects to predictably improve the system by enhancing the efficiency of use of the available bandwidth in Hou's communication channels. DISH-1003, ¶75. Konschak's disclosure regarding reduction of overhead associated with transmissions using calculated cyclic extensions would have reinforced the POSITA's understanding. *Id.*, ¶75; DISH-1006, [0005]-[0007].

Finally, a POSITA would have sought to optimize the cyclic prefix used when implementing OFDM communications in Hou's system, particularly given

Hou's disclosure of measuring an "echo delay spread" from each CM to the CMTS. DISH-1003, ¶76. The relationship between the "delay spread" of a channel and cyclic prefixes used for transmissions across that channel was well-known in the art. *Id.*, ¶¶56-57, 76; DISH-1002, 358 ("***different cyclic prefixes*** are to be ***used with*** channels that have ***different amounts of delay spread***"), 472 ("***[t]he relationship between cyclic prefix length and multipath delay spread*** is well understood by those skilled in the art"); DISH-1014, 1:63-66 ("the introduction of a ***guard interval and a cyclic prefix*** as the guard interval further ***mitigates adverse effects of multipath propagation*** and ***delay spread*** on systems"); DISH-1011, 3:6-7 ("***Based on the delay spread*** of the multi-path channel, ***a specific guard-time must be chosen***"); DISH-1015, [0002] ("In OFDM, ***cyclic guard intervals*** are frequently used to improve performance in the presence of a ***multipath channel***."), [0022] ("As known in the art, ***cyclic prefixing*** contributes to making OFDM transmissions ***resistant to multipath effects***."); DISH-1030, 7:59-8:3 ("The length of the ***cyclic prefix*** is a function of the ***multipath*** time displacement"). As Hou already discloses measuring the delay spread of the channel of communication from each CM to the CMTS in connection with the assignment of burst profiles, a POSITA would have found it obvious to incorporate Konschak's teachings of calculating cyclic prefixes based on measured channel multipath delay profiles to have optimized cyclic prefixes to further enhance Hou's

goal of efficient channel bandwidth usage. DISH-1003, ¶77; DISH-1006, [0011]; DISH-1005, 5:53-6:6.

The fact that Konschak is directed to a wireless network would not discourage a POSITA from looking to Konschak to improve Hou's system. Hou specifies that CMs and CMTSs like its own are used in both wired coaxial cable networks and wireless networks. DISH-1005, 1:22-34.

Further, a POSITA would have understood that wired and wireless networks share several considerations in common for transmitting and receiving data. DISH-1003, ¶78. As generally known in the art, it was a straightforward process to apply teachings from wired communication networks (such as that described in Hou) to wireless communication networks, and vice versa. *Id.*, ¶78; DISH-1010, 4:6-14 ("The DOCSIS v1.1 standard defines a MAC layer protocol that finds application in ***not only data over cable networks*** but also ***in wireless networks***."); DISH-1013, 22:1-10 ("While the discussion to this point has focused on . . . ***cable networks***, the technology of the present invention may be applied to any access or shared-access network. . .included[ing], in addition to cable networks, ***wireless networks***, Ethernet, FastEthernet, GigabitEthernet, LANs, etc."); DISH-1017, 4:15-18 ("a ***MAC protocol developed for transmission over cable systems*** may be used to coordinate upstream communications ***in wireless network 100***"); DISH-1016, 1:22-26 ("A good OFDM synchronization technique will be applicable to

more than the wireless high speed data communication system currently being studied—OFDM is being used or being considered in a variety of LEC networks in the form of ***ADSL***, in Digital Audio Broadcast systems, ***in cable modems***, and in digital television systems"); DISH-1015, [0020] ("The communications links 20(*l*)-(*n*) ***can be wired*** (including for example, fibre, ***coaxial cable***, twisted pair, etc.) ***or wireless*** links"); DISH-1007, 18:48-56 ("It should be apparent to one skilled in the art that the modem transport architecture described herein . . . could be utilized with distribution networks other than ***hybrid fiber coax networks***. For example, the functionality could be performed with respect to ***wireless systems***."). Given Hou and Konschak's similar goals as described above, a POSITA would have looked to Konschak's wireless teachings and understood that those teachings would have been applicable to Hou's system. DISH-1003, ¶78-81.

(c) Reasonable Expectation of Success

As discussed above, a POSITA would have understood that Hou and Konschak both describe techniques for using parameters measured over a communication channel to adjust transmission parameters and optimize communications. DISH-1003, ¶¶69-71. This is particularly so because Hou and Konschak are analogous art to the '539 patent, so a combination of the two references would have been predictable. Hou is analogous art to the '539 Patent because both Hou and the '539 patent are from the same field of endeavor—Hou is

directed to improving the communications in a coaxial cable modem network (by "increasing physical layer flexibility" through "performance measurements" and assignment of burst profiles for better bandwidth efficiency), while the '539 patent is also directed to improving the communications in a coaxial cable modem network (by using channel measurements to optimize particular transmission parameters such as the cyclic prefix or preamble to measured channel characteristics). DISH-1003, ¶83; DISH-1005, 6:5-6, 6:30-45; DISH-1001, Abstract, 5:17-32, 9:62-65.

Similarly, Konschak is analogous art to the '539 Patent because Konschak is reasonably pertinent to the problems that the '539 Patent's inventors faced—Konschak confronted the issue of adapting transmission parameters based on measured parameters of a channel (in particular a cyclic prefix in OFDM communications adapted to measured channel delay profiles), as did the '539 Patent's inventors. DISH-1003, ¶84; DISH-1001, 9:56-65 (describing "Echo Profile probes" used to "measure node delay spread" to "optimize the preamble and cyclic prefix ('CP') requirements or other parameters), 10:30-32 (similar); DISH-1006, Cover (noting "transmission overhead caused by the cyclic extensions can be significantly reduced by adapting the length of the cyclic extensions to the delay properties of the actually used transmission channel"), [0015] (explaining cyclic prefix length is set given measured delay values by using a lookup table or

calculating a length "precisely adapted to the delay properties of the transmission channel").

Moreover, given Hou's disclosure of measuring an echo delay spread of the channel from each CM to the CMTS (DISH-1005, 13:1-15), the notion of adjusting the cyclic prefix of communications based on measured delay properties would have been straightforward from a POSITA's perspective. DISH-1003, ¶85. Likewise, a POSITA would have expected Konschak's cyclic prefix adjustment technique to work in Hou's system when implementing OFDM communications because Hou employed transmission parameter adjustments in other aspects of its disclosure, for example, adjusting the preamble length based on measurements of the channel. DISH-1003, ¶86; DISH-1005, 7:40-8:22. Incorporating Konschak's cyclic prefix adaptation to account for measured delay properties in Hou-Konschak's system using OFDM would have been within the skill level of a POSITA because the relationship between cyclic prefixes and delay spreads was well-understood in the art. DISH-1003, ¶86; DISH-1002, 358; DISH-1014, 1:63-66; DISH-1011, 3:6-7; DISH-1015, [0002].

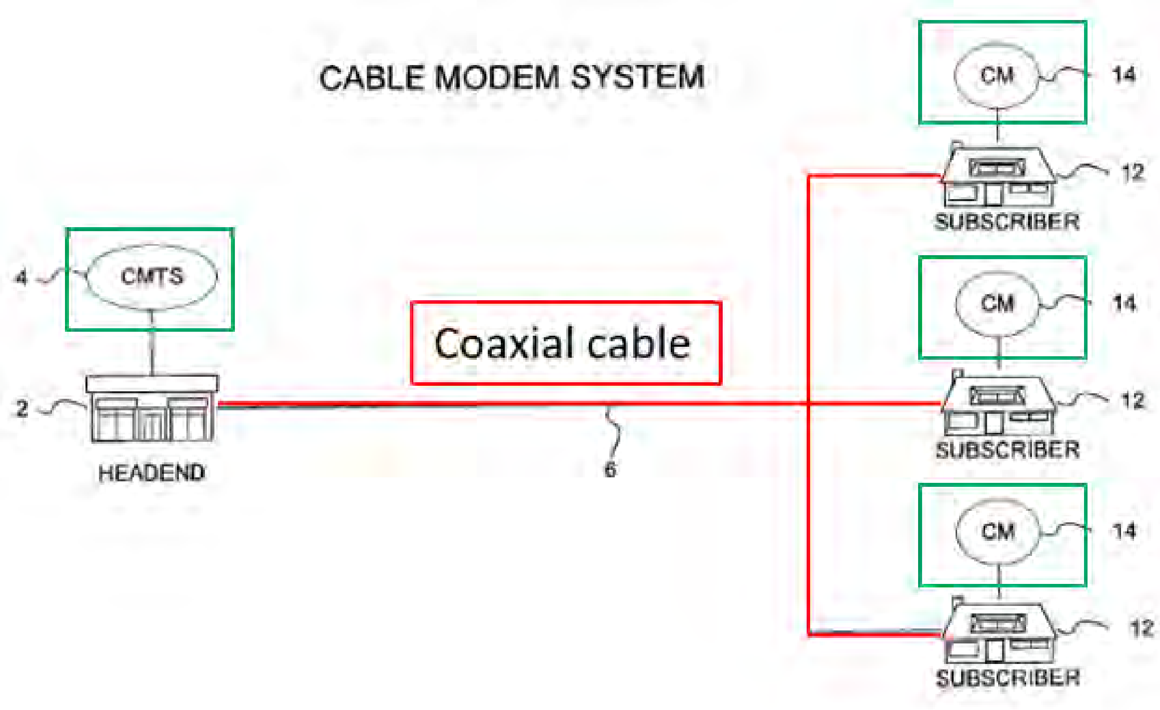
Further, Hou-Konschak represents a combination of known elements (Hou's method of assigning burst profile parameters; Konschak's method of adapting cyclic prefixes) each performing the functions it had been known to perform (Hou's assignment of particular burst profiles to each CM in the network;

Konschak's cyclic prefixes adapted to particular channels' measured delay profiles) to produce the predictable result of reducing transmission overhead and improving channel bandwidth efficiency. DISH-1003, ¶87. As such, a POSITA would have reasonably expected a successful outcome from combining Konschak's teachings regarding adapting cyclic prefixes using measured delay spreads with Hou's cable modem system when utilizing OFDM communications. *Id.*, ¶87.

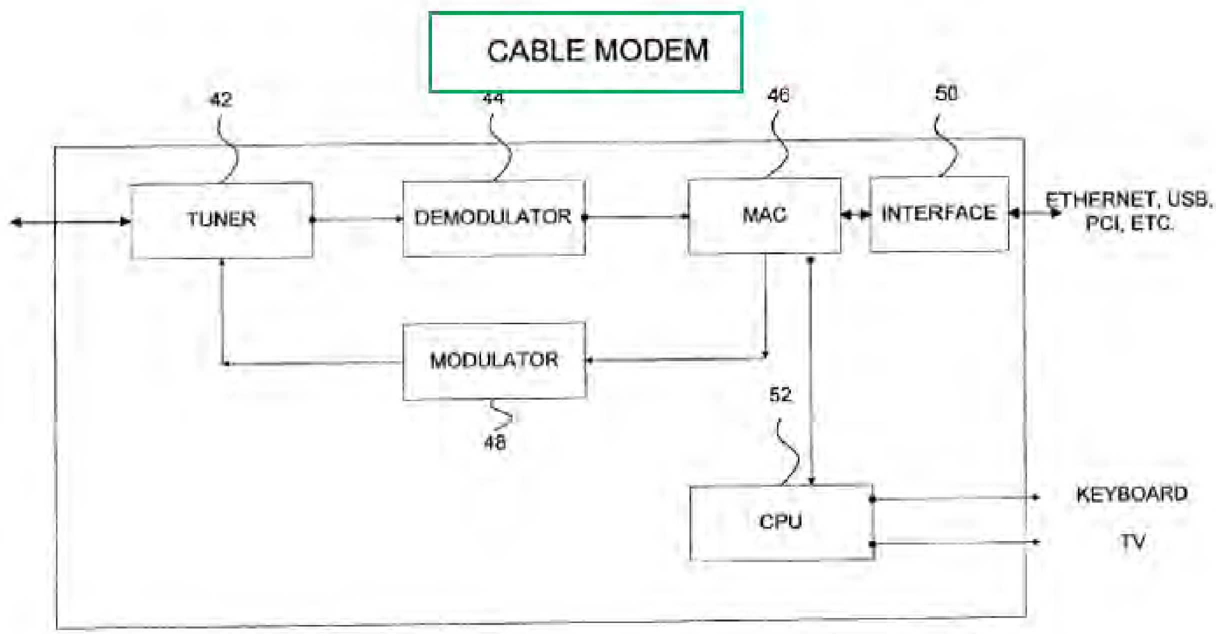
4. Claim 1

[1pre] "A modem for communication to at least one node across at least one channel of a coaxial network, the modem comprising:"

To the extent the preamble is limiting, in the Hou-Konschak combination, Hou discloses or renders obvious [1pre]. DISH-1003, ¶88. Hou discloses a "conventional cable modem system" where a CMTS communicates with multiple CMs, where each of the CMTS and CMs is a modem. DISH-1005, 1:7-10, 1:21-38.



DISH-1005, Fig. 1 (PRIOR ART).



DISH-1005, Fig. 3 (PRIOR ART).

The CMs communicate with the CMTS by delivering data through "channels" in "an access network," which are "***coaxial cable***, Hybrid Fiber Coax (HFC), or wireless." *Id.*, 1:21-42. As such, the CM in Hou's network is a "modem" for communicating with the CMTS (the claimed "node") across the channel between the CM and CMTS. DISH-1003, ¶91. Accordingly, to the extent the preamble is limiting, Hou-Konschak discloses or renders obvious "[a] modem for communication to at least one node across at least one channel of a coaxial network."

[1a] "a transmitter; and"

In the Hou-Konschak combination, Hou discloses or renders obvious [1a]. DISH-1003, ¶92. The '539 patent explains that the "PHY Transmitter provides the interface to the coaxial cable within the BCN, and performs all of the necessary RF, analog and digital processing required for transmitting MAC messages on the coaxial communications channel." DISH-1001, 4:42-55. The '539 patent's "transmitter of the probe [packet)" is also responsible for transmission of packets over the cable system. *Id.*, 10:28-29.

Hou repeatedly describes the CMTS and CM transmitting signals and data packets to each other over a coaxial cable network. DISH-1005, 1:21-42, 1:45-49, 2:30-41, 3:4-10, 3:34-36, 3:47-53, 3:60-62, 4:22-25, 6:18-22. For this reason alone, a POSITA would have found a transmitter inherent in, or at least obvious

over, Hou's disclosure of data transmissions, which is consistent with the '539 patent's description of the functionality of a transmitter. DISH-1003, ¶94.

Indeed, Hou discloses a "modulator" that converts digital data into radio-frequency signals for transmission. *Id.*, 3:34-36. As Dr. Guerin explains, a POSITA would have understood that cable modems (like Hou's CMs) would "typically" include a "transmitter" that modulates a signal for transmissions. DISH-1003, ¶95; DISH-1024, [0005], [0020] ("Each modulator . . . comprises a transmitter . . ."). A POSITA would thus have understood or at least found obvious from Hou's disclosure of a modulator that Hou's CMs would have comprised at least one "transmitter" that was used to transmit data packets to the CMTS over the coaxial cable network, and vice versa. DISH-1003, ¶¶95-96. A POSITA would also have understood that a transmitter" was a known component used by a CM to transmit the types of data packets and signals Hou discloses over a coaxial cable network. *Id.*, ¶¶95-96.

Accordingly, Hou-Konschak discloses or renders obvious "a transmitter."

[1b] "a MAC layer in signal communication with the transmitter, the MAC layer using at least one probe packet as an echo profile probe to measure node

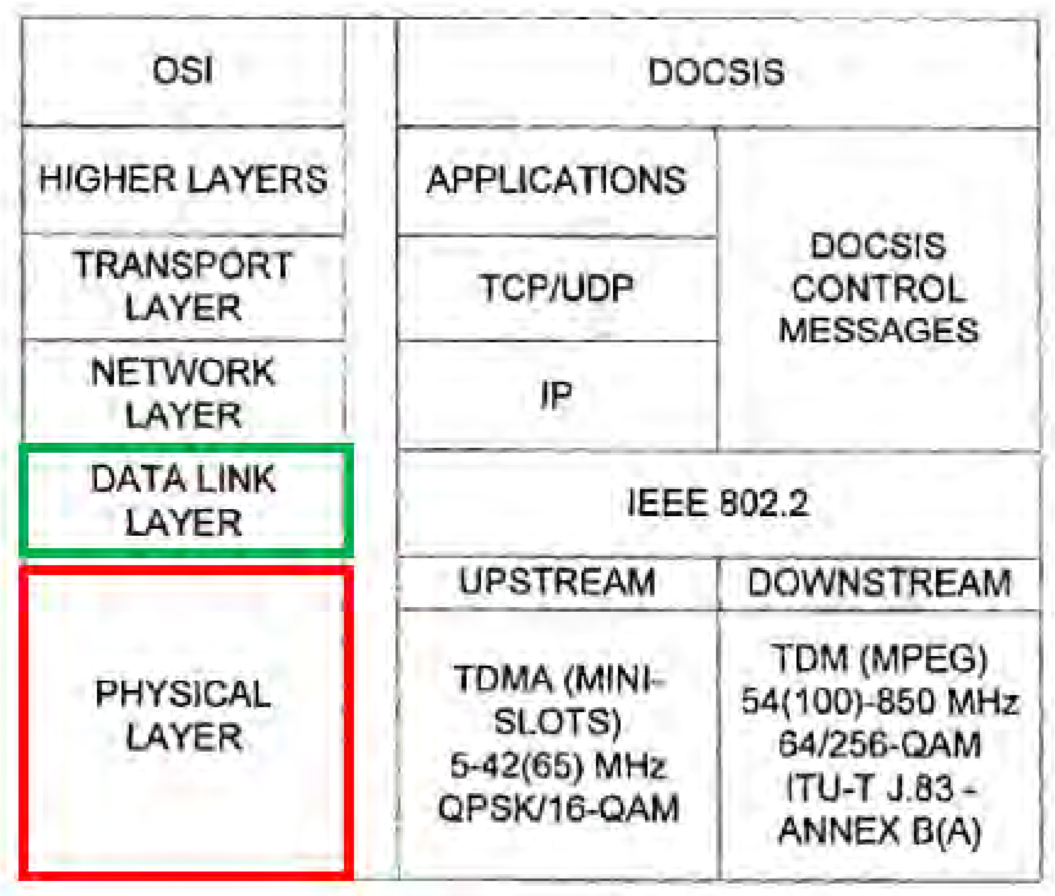
delay spread on the network and the MAC layer optimizing[8] the preamble and cyclic prefix requirements or other parameters in response to the measured node delay spread on the network;

Hou-Konschak renders obvious [1b]. DISH-1003, ¶97.

"a MAC layer in signal communication with the transmitter,"

Hou-Konschak renders obvious a MAC layer in signal communication with the transmitter. Hou describes that each "conventional cable modem" includes "a tuner 42, a demodulator 44, a media access control (MAC) device 46, and a modulator 48." DISH-1005, 3:11-14. The "MAC 46 is positioned above the upstream and downstream physical layer portions of the CM 14." *Id.*, 3:42-53. In describing the Open Systems Interconnection (OSI) for a DOCSIS cable modem, Hou depicts the "data link layer" above the physical layer, as shown below in Figure 4. *Id.*, 4:7-12.

[8] Although the scope and bounds of the term "optimizing" are unclear, as best understood in view of the specification, "optimizing" encompasses at least what is disclosed in Hou and Konschak, as explained herein.

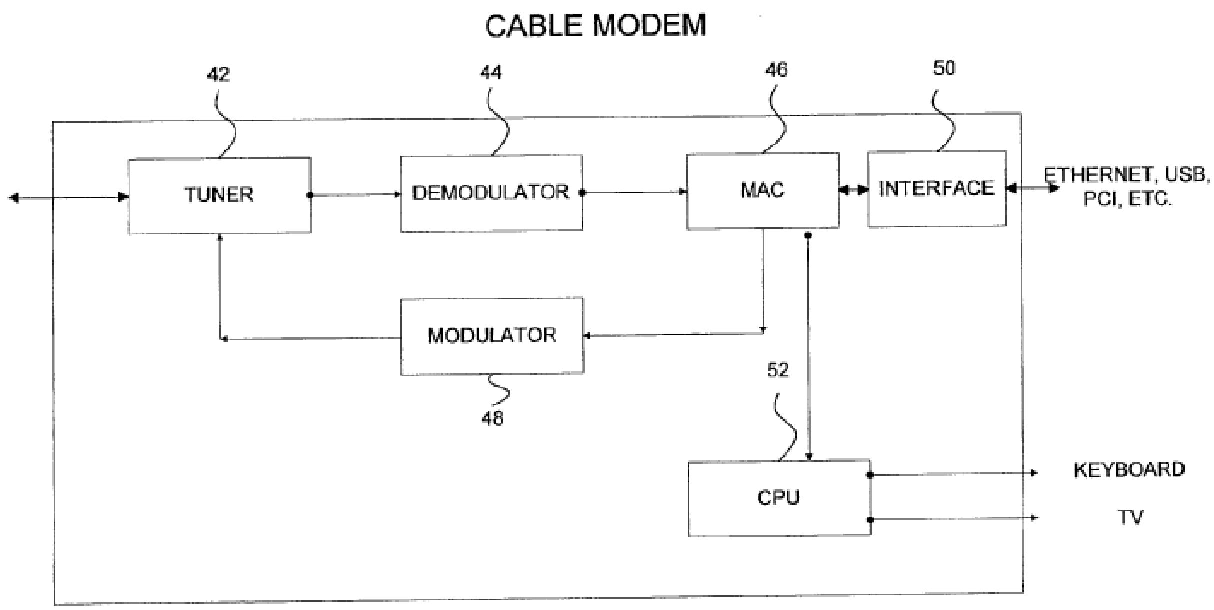


DISH-1005, Fig. 4 (PRIOR ART).

A POSITA would have understood that the MAC layer was a known part of a Data Link Layer, and would have understood Hou's disclosure of a "MAC" (or "MAC device") that is positioned above the physical layer of the CM to refer to a MAC layer that is part of the depicted Data Link Layer. DISH-1003, ¶¶99-101; *see also* DISH-1001, 4:38-55 (stating it was known that the Physical (PHY) Layer is "adjacent" to "MAC Layer or Data Link Layer"); DISH-1017, 4:31-33 ("In reference to the well-known OSI multi-level model of data communications, the

MAC layer . . . corresponds to a lowest sublayer ***of the data link layer***.”); DISH-1031, 41:17-29 (explaining data link layer “can include a medium access control (MAC) layer”).

Further, as discussed above, Hou’s teachings toward its modulator disclose or render obvious the use of a transmitter. DISH-1003, ¶¶95-96, 102; *see also* DISH-1005, 2:35-41, 3:4-10. As discussed above, a POSITA would have at least found obvious from Hou’s disclosure of a modulator that Hou’s CMs use transmitters for packet transmissions. DISH-1003, ¶¶95-96, 102. A POSITA also would have understood that the transmitter would have been in signal communication with the MAC layer in Hou’s CM. *Id.*, ¶102. Indeed, Hou’s “modulator,” part of the transmitter used for data sent over the network, is, as depicted in Figure 3, in communication with the MAC layer. DISH-1005, 3:11-23, 3:34-52.



DISH-1005, Fig. 3 (PRIOR ART).

Accordingly, Hou-Konschak discloses or renders obvious "a MAC layer in signal communication with the transmitter."

"the MAC layer using at least one probe packet as an echo profile probe to measure node delay spread on the network"

As detailed below, Hou renders this claim element obvious in view of Konschak. Hou renders obvious a probe packet used to measure delay spread, and adjustment of a preamble based on that measurement. The addition of Konschak's reference symbol to Hou's probe packet renders obvious the adjustment of the cyclic prefix based on the delay spread measurement.

Hou teaches that the MAC layer uses a probe packet as an echo profile probe to measure, among other quantities, node delay spread on the network. Hou

explains that the CM sends messages to the CMTS, which conducts performance measurements on those messages, and the CM then makes adjustments based on those measurements. Specifically, Hou describes the CMTS conducts "performance measurements" on CMs in the network using the CMs' upstream transmissions. DISH-1005, 6:37-43, 7:20-26, 8:44-46, 8:59-65. The CMTS performs measurements of upstream transmissions from the CMs—including of an "Echo Delay Spread (measurement of Amplitude of echo and its delay)"—"on a per CM basis" and uses the results to "determine appropriate burst profiles to assign" to the CMs in the network. *Id.*, 13:1-18. Hou's description is consistent with that in the '539 patent, which describes the "receiving node analyzing the received signal" and then sending "channel response information" back to the transmitting node, which uses that information to "change its transmission format to optimize the link communications to the channel response." DISH-1001, 5:20-31. A POSITA would further have understood that the echo delay spread measured by Hou refers to the same notion of delay spread as discussed in the '539 patent. DISH-1003, ¶104; DISH-1001, 9:62-65 ("Echo Profile ('EP') Probes whose purpose is to measure node delay spread on the network in order to optimize the preamble and the Cyclic Prefix ('CP') requirements or other parameters"), 14:14-16 ("The cyclic prefix length is dependent on the multi-path delay spread in the cable system").

Hou further renders obvious taking its measurements with a "probe packet" via Hou's CMTS taking measurements using a "ranging protocol." DISH-1005, 2:58-66. Although Hou does not specify using packets for its ranging measurements, a POSITA would have understood that the ranging protocol refers to a well-known process in point-to-multipoint cable networks whereby a CMTS and CM exchange messages to configure transmission settings from the CM to the CMTS. DISH-1003, ¶105. For example, Hou's ranging protocol "effectively moves the 'clock' of the individual CM 14 back or forth" to compensate for delays arising from the physical distance between the CMTS and each CM, and/or to adjust each CM's transmit power level to ensure that upstream bursts from the CMS arrive at the CMTS at the same power levels. DISH-1005, 2:58-3:3.

Min (DISH-1018), a patent publication that was published prior to the '539 patent's claimed priority date, explains that a typical ranging process in a point-to-multipoint system according to the DOCSIS specification (such as that in Hou) involves each CM sending a ranging request message ("RNG-REQ") to the CMTS, and receiving a ranging response message ("RNG-RSP") from the CMTS. DISH-1003, ¶52, 106; DISH-1018, [0081]-[0082]. The RNG-RSP received from the CMTS contains information regarding parameter adjustments (including adjustments to "timing" and "power level" to ensure arrival of messages at the CMTS at the "appropriate times" and "proper power level," respectively) to

optimize the transmissions between the CM and the CMTS. DISH-1003, ¶52, 106; DISH-1018, [0083]-[0084]. A POSITA would thus have understood that Hou's ranging protocol used to adjust timing and power levels refers to the known, typical ranging processes like those described in Min, and would include the same use of RNG-REQ and RNG-RSP messages and resulting adjustments to transmission parameters. DISH-1003, ¶106.

While Hou conducts "performance measurements" on CMs' transmissions, it does not expressly disclose conducting these measurements using "probe packets," only requiring that each CM use burst profiles for the transmission being measured. DISH-1005, 8:44-65. Hou further explains that certain burst profile types correspond to a burst profile, including the "initial ranging" and "periodic ranging" types. *Id.*, 4:32-42. As such, a POSITA would have found obvious that the RNG-REQ messages ("at least one probe packet") exchanged as part of known ranging protocols would have been transmitted by each CM using burst profiles, and therefore would have been appropriate vehicles by which to measure the parameters Hou discloses for assigning burst profiles to the CMs. DISH-1003, ¶107.

The '539 patent explains that the "main function" of a "probe packet" is to "probe the network and its frequency response" for "internode link throughput optimization." DISH-1001, 9:49-52. To the extent Patent Owner asserts that Hou

does not expressly disclose a "probe packet," Hou at least renders obvious using the well-known RNG-REQ message (like that expressly discussed in Min) as a probe packet to measure node delay spread on the network as part of its ranging process. The "main function" of a "probe packet" is to "probe the network and its frequency response" for "internode link throughput optimization." DISH-1001, 9:49-52. The specific "echo profile probe," or "EP probe," is used to "measure node delay spread on the network." *Id.*, 9:56-65. Like the "probe packet" in the '539 patent, Hou explains that the purpose of its measurements (which include echo delay spread) are to decide whether to change a CM's burst profile in order to improve bandwidth efficiency (i.e., "throughput"). DISH-1005, 8:59-65, 13:1-15. A POSITA would have found it obvious to use the RNG-REQ message (which, as explained above, is at least rendered obvious by Hou's disclosure of ranging protocols) as a probe packet to take Hou's measurements, including the echo delay spread, to determine and return parameter adjustment information to each CM. DISH-1005, 13:1-15; DISH-1003, ¶107-109. The ranging process was a well-known process in DOCSIS-compliant cable modem networks like Hou's, used by the CMTS to adjust CM transmission parameters. DISH-1003, ¶52, 110; DISH-1018, [0081]-[0084]. Since Hou already discloses the CMTS using the measured parameters, such as echo delay spread, to assign burst profiles based on channel measurements to each CM, a POSITA would have found it obvious to use RNG-

REQ messages (which would be functionally equivalent to the ’539 patent’s claimed echo profile probes) to measure those parameters. DISH-1003, ¶109; DISH-1005, 13:1-15.

Additionally, Konschak discloses transmission and receipt of a “reference symbol,” which is compared to an “expected reference symbol” by the receiving node, and then used to “extract[] a channel delay profile from the comparison.” DISH-1006, [0014]. This method of delay profile extraction is consistent with the ’539 patent’s description of using probe packets to obtain “channel characterizations of the link” between two nodes by “comparing” a “received signal” to an “a priori known transmit signal format.” DISH-1001, 5:17-32. Konschak’s channel delay profile measures “multipath effects” that cause “echoes” of transmitted data leading to “intersymbol interference.” DISH-1006, [0002]. While the ’539 patent does not explain the term “echo profile,” it explains that “echo profile probes” measure “delay spread” on the network to optimize the preamble, cyclic prefix, or other parameters, and that the cyclic prefix is dependent on the ***multi-path*** delay spread.” DISH-1001, 9:62-65, 14:12-16; *see also* DISH-1002, 472 (explaining “[t]he relationship between cyclic prefix length and multipath delay spread is well understood by those in the art”). A POSITA would have understood that the Konschak’s delay profile measurements correspond to the ’539 patent’s echo profile measurements because both measure signal transmission

delays across the various frequencies being used. DISH-1003, ¶113; DISH-1002, 484. Based on Konschak's teachings, a POSITA would further have understood the value in extracting Konschak's delay profiles using a symbol that is transmitted to a receiving node that has information about the symbol being transmitted, to enable a comparison of the transmitted and expected symbols for a channel estimation. DISH-1003, ¶113. A POSITA would thus have found it obvious to rely upon a reference symbol as disclosed in Konschak to enhance Hou-Konschak's CM OFDM transmissions, which already measure an echo delay spread, to obtain Konschak's disclosed benefits and enhance Hou's goal of increasing bandwidth efficiency in Hou's network when employing OFDM transmissions. DISH-1003, ¶113-114.

As such, Hou-Konschak would have rendered obvious the claimed "probe packet" because a POSITA would have extended the RNG-REQ message of Hou's ranging process to include a reference symbol as Konschak teaches. DISH-1003, ¶114; DISH-1006, [0014]. A POSITA would have been motivated to extend Hou's parameter-optimizing RNG-REQ probe messages used by Hou to include a "reference symbol" as disclosed by Konschak in order to obtain the bandwidth efficiency benefits disclosed in Konschak. DISH-1003, ¶114. As Hou does not specify a packet type for its measurements, a POSITA would have understood that packet messages from the CM to the CMTS utilizing Konschak's "reference

symbol" would enable the CMTS to measure the parameters disclosed in Hou, including the echo delay spread. DISH-1005, 8:44-46, 13:1-15; DISH-1003, ¶114. Including the reference symbol in Hou-Konschak's transmissions would also have allowed the system to extract the delay profile measurements disclosed in Konschak, such as the extracting a channel delay profile from the comparison result of the comparing means, on the basis of which the delay value is determined. DISH-1006, [0014]. It would have been within the ability of a POSITA to extend Hou's RNG-REQ message to include such a reference symbol to take Konschak's disclosed measurements. DISH-1003, ¶114.

To the extent Patent Owner asserts that neither Hou nor Konschak expressly states that the ***MAC layer*** uses the probe packet (the RNG-REQ message containing Konschak's reference symbol) to measure node delay spread on the network, a POSITA would have found this obvious. DISH-1003, ¶115. For example, a POSITA would have found it obvious to use Hou's MAC layer to implement a probe packet to measure the node delay spread. *Id.*, ¶115. It was known in the art, and in cable modem systems in particular, for the MAC layer to construct the data packets used in transmissions between a CM and a CMTS. DISH-1003, ¶115-117; DISH-1018, [0068]. It was further known in the art to utilize the MAC layer to transmit packets containing information for maintaining and/or improving communications between a CM and a CMTS. DISH-1003,

¶¶117; DISH-1008, 3:24-32 ("slot timing information and/or data-type information is transmitted from a MAC to a burst receiver so as to facilitate processing of upstream data packets"); DISH-1009, 2:65-3:1 ("MAC layer 130 is also responsible for sending out polling messages as part of the link protocol between the CMTS and the cable modems that is necessary to maintain a communication between the two"), 4:36-40 (describing "a method of checking on demand the quality of a communication link between a cable modem and a [CMTS] . . . using MAC layer functionality"); DISH-1017, 2:35-40 (describing "ranging and power control operation[s]" as a "MAC layer power control operation"), 5:4-27 (MAC layer "implement[ing] ranging" and "power control"); DISH-1025, 9:7-16 (describing CMTS's MAC layer "inform[ing] the modem (likely by the ranging protocol if DOCSIS is used)" of a "particular frequency and power" for signal transmissions), 9:30-32 ("MAC layer logic block may control the time slot allocation and ranging procedures required by the DOCSIS standard for transmission of data").

Indeed, a POSITA would have known that in DOCSIS-compliant systems (like Hou's), the MAC layer was involved in the transmission of messages that measure various parameters used for parameter adjustments in coaxial cable networks. *E.g.*, DISH-1029, 57-58 (describing a "Time Synchronization" "MAC Management Message"), 64-66 (describing the ranging request RNG-REQ and

ranging response RNG-RSP messages as "MAC Management Messages"). In fact, in the DOCSIS ranging protocol, synchronization between the CMTS and CM using an "Upstream Channel Descriptor ***MAC management message***" was a requirement. *Id.*, 85.

A POSITA would thus have found it obvious to implement Hou-Konschak's probing functionality in Hou's MAC layer. DISH-1003, ¶115-118. As described above, a POSITA would have been aware of well-known methodologies of using the MAC layer for ranging and other functionality used to measure and improve the links between a CM and a CMTS. *See, e.g.*, DISH-1009, 2:65-3:1, 4:36-40; DISH-1017, 2:35-40, 5:4-27; DISH-1010, 6:36-44; DISH-1025, 9:7-16, 9:30-32; DISH-1029, 57-58, 64-66, 85. A POSITA would have known to use the MAC layer for ranging operations and for other ways of measuring and ensuring stable links between nodes, e.g., Hou's CM and CMTS. Accordingly, it would have been obvious to a POSITA to use the MAC layer for transmitting Hou's RNG-REQ packet with Konschak's reference symbol. DISH-1003, ¶118. Using the MAC layer would have constituted combining prior art elements according to known methods to yield predictable results. DISH-1003, ¶118.

Accordingly, Hou-Konschak renders obvious "the MAC layer using at least one probe packet as an echo profile probe to measure node delay spread on the network."

"and the MAC layer optimizing the preamble and cyclic prefix requirements or other parameters in response to the measured node delay spread on the network."

Hou-Konschak renders obvious the MAC layer optimizing preamble and cyclic prefix requirements or other parameters in response to the measured node delay spread on the network. Hou discloses that the CM adjusts (optimizes) its parameters based on information received from the CMTS, which takes performance measurements that it uses to assign burst profiles to CMs, including measuring the echo delay spread. DISH-1005, 13:1-15. Hou further discloses that "the CMTS assigns a burst profile" to each CM "based on the CM performance measurements and the level of robustness needed." *Id.*, 7:21-26. The burst profiles assigned by the CMTS have "key parameters that relate to the robustness of the burst profile" that can be adjusted, including the "length of the preamble." *Id.*, 8:23-27. Indeed, given Hou's goal of increasing bandwidth efficiency (*id.*, 6:5-6), a POSITA would have understood the preamble to be one of the more important parameters to adjust in Hou's system because of the desire to avoid increasing the overhead in transmissions due to the preamble being longer than necessary. DISH-1003, ¶119. For example, Hou discloses varying preamble lengths across three exemplary burst profiles depending on the level of robustness:

Burst Profile 1: Highly Robust

Burst Profile Attributes	
Modulation	QPSK
Differential Encoding	Off
Preamble Length	180
R-S Error Correction (T bytes)	10
R-S Codeword Information Bytes (k)	80
R-S Shortened Last Codeword	On
Scrambler Seed	142
Maximum Burst Length (minislots)[a]	0
Guard Time	8
Scrambler On/Off	On

Burst Profile 2: Moderately Robust

Burst Profile Attributes	
Modulation	QPSK
Differential Encoding	Off
Preamble Length	100
R-S Error Correction (T bytes)	4
R-S Codeword Information Bytes (k)	100
R-S Shortened Last Codeword	On
Scrambler Seed	142
Maximum Burst Length (minislots)[a]	0

-continued

Burst Profile Attributes	
Guard Time	8
Scrambler On/Off	On

Burst Profile 3: Less Robust

Burst Profile Attributes	
Modulation	16-QAM
Differential Encoding	Off
Preamble Length	64
R-S Error Correction (T bytes)	2
R-S Codeword Information Bytes (k)	120
R-S Shortened Last Codeword	On
Scrambler Seed	142
Maximum Burst Length (minislots)*	0
Guard Time	8
Scrambler On/Off	On

DISH-1005, 7:36-8:22.

Once the CMTS assigns a CM a burst profile, the CM will update its future transmissions accordingly. *Id.*, 8:43-65. The '539 patent provides an example of the construction of a preamble based on five different choices, with one being selected based on information provided by the MAC layer. DISH-1001, 14:17-34. Similarly, Hou describes selection of the proper preamble to use for its transmissions (through selection of one of a number of burst profiles, each of which has an associated preamble length) in essentially the same way the '539 patent describes it (by choosing one of five preamble lengths). *Id.*; DISH-1003, ¶122; DISH-1005, 8:43-65.

Konschak further discloses optimizing the cyclic prefix in response to the measured delay spread. The use of "cyclic extensions" (*i.e.*, cyclic prefixes) was

known in the art as a way to overcome the problem of transmissions "arriv[ing] as delayed symbols or echoes" due to "multipath effects." DISH-1006, [0002], [0004]. Moreover, as the Applicant admitted during prosecution, the use of different cyclic extensions or prefixes for different amounts of delay spread was also known in the art. *Id.*, [0005]; DISH-1002, 357-358.

Konschak discloses a receiving node using a "reference symbol" from a transmitting node to calculate a delay value representing the multipath delay spread effects in the channel between the nodes, and using that delay value to set the length of the cyclic extension to be used in future communications. DISH-1006, [0002], [0009], [0010], [0011], [0014]. Konschak explains that the cyclic extension is either set using a look-up table based on the delay values, or "precisely adapted to the delay properties of the transmission channel." *Id.*, [0014], [0015]. As discussed above, a POSITA would have included Konschak's reference symbol with the RNG-REQ messages that are part of the typical ranging procedures described in Hou as a probe packet to measure the channel's properties. DISH-1003, ¶¶111-114,123-124. With Konschak's teachings incorporated into Hou's system using OFDM communications, the CMTS would have included adjustments to the cyclic prefix (Konschak) and preamble (Hou) based on the measured channel delay properties and delay spread, for the CM to use in its next transmission. DISH-1003, ¶125.

The adjustments taught by Hou and Konschak are further consistent with how the ’539 patent describes optimizations. DISH-1003, ¶126. The ’539 patent describes using echo profile probes to “optimize the preamble and Cyclic Prefix (‘CP’) requirements or other parameters.” DISH-1001, 9:62-65. Hou assigns burst profiles based on capabilities for “greater bandwidth efficiency,” including adjustments to the preamble length. DISH-1005, 5:52-6:6, 7:43-8:22. Similarly, Konschak discloses adapting cyclic extensions to the delay properties of the transmission channel to “significantly reduce[]” the transmission overhead while maintaining quality. DISH-1006, Cover. From these disclosures, a POSITA would have understood that transmissions utilizing Hou and Konschak’s teachings would have adapted both the preamble and cyclic prefix to a particular transmission channel based on node delay spread measurements of that channel, thereby optimizing those parameters for efficient bandwidth use in that channel. DISH-1003, ¶¶126-127.

Additionally, a POSITA would have found it obvious to use the MAC layer in Hou’s CMs to implement Hou-Konschak’s transmission parameter optimization. DISH-1003, ¶128. As discussed above, a POSITA would have found it obvious to use the transmissions for measuring the delay spread using the MAC layer. *Id.*, ¶¶115-118, 128. Further, it was known in the art to utilize the MAC layer to optimize the communications in a CMTS-to-CM network using information sent

by the CMTS to the CMs. DISH-1003, ¶¶128; DISH-1008, 3:24-32 ("The error information is used by the MAC to facilitate spectrum management which enhances the data rate and/or reliability of upstream communications."); DISH-1025, 9:7-16 (describing CMTS using MAC layer to "inform the modem (likely by the ranging protocol if DOCSIS is used)" of a "particular frequency and power" at which to transmit signals). A POSITA would thus have found it obvious to have the MAC layer in the CM optimize the preamble and cyclic prefix parameters using the values calculated by the CMTS using the measured delay spread. DISH-1003, ¶128.

Accordingly, Hou-Konschak renders obvious "the MAC layer optimizing the preamble and cyclic prefix requirements or other parameters in response to the measured node delay spread on the network."

[1c] "wherein the transmitter communicates the at least one probe packet."

Hou-Konschak renders obvious [1c]. DISH-1003, ¶129. As discussed above with respect to limitation [1b], the probe packet in Hou-Konschak (the RNG-REQ as part of the ranging protocol in Hou, with the reference symbol as disclosed in Konschak) is transmitted by the CM to the CMTS. DISH-1003, ¶¶97-128, 130. A POSITA would have at least found it obvious to utilize the transmitter in the CM to transmit the probe packet across the coaxial cable network to the CMTS. *Id.*, ¶130.

To the extent Patent Owner argues that claim 1 requires the same MAC layer that "measure[s] node delay spread" and "optimiz[es] the preamble and cyclic prefix requirements or other parameters" also "communicate[] the at least one probe packet," such a reading of the claim is contrary to the'539 patent specification, which explains that "the PHY Transmitter may ***transmit a probe signal*** or several probe signals" and subsequently "***receive*** a plurality of response signals," wherein "each of the response signals includes a channel characterization of the link." DISH-1001, 5:20-25. "[T]he ***receiving node*** analyz[es] the received signal and compar[es] it to an a priori known transmit signal format," and sends back the "channel response information" to the ***transmitting node***, which then "change[s] its transmission format to optimize the link communications to the channel response." *Id.*, 5:25-32. Thus, Hou-Konschak's disclosure of the CM transmitting a reference symbol to the CMTS, which then measures the delay spread, and the CM adjusting its preamble and cyclic prefix in response to the CMTS's comparison of the reference signal to the stored reference signal, is consistent with the '539 patent's description of the claimed procedure. DISH-1005, 8:44-46; DISH-1006, [0021].

Accordingly, Hou-Konschak renders obvious "the transmitter communicates the at least one probe packet."

B. GROUND 2: Claims 27 are Rendered Obvious by Hou, Konschak, and Dapper

1. Overview of Dapper

Dapper is entitled "Distributed Control in a Communication System." DISH-1007, Cover. Dapper published on April 2, 2002, more than a year before the earliest claimed priority date of the '539 patent. *Id*. Accordingly, Dapper qualifies as prior art under at least 102(b).

Dapper is directed to improving communications in a system with a "distribution network" with a "head end terminal" that sends and receives signals to and from downstream "service unit[s]." *Id.*, Abstract. For example, Dapper teaches that its network includes a "hybrid fiber-coaxial (HFC) distribution network," and known "modem transport architecture[s]" using OFDM. *Id.*, 18:17-20, 18:48-52, 19:9-13. The head end terminal "detects at least one local transmission characteristic of a service unit" and "generates an adjustment command as a function of the detected at least one local transmission characteristic." *Id.*, 5:11-14. The service unit "adjusts the at least one local transmission characteristic when an adjustment command is received from the head end terminal." *Id.*, 5:15-18, 8:61-9:5.

Dapper discloses a number of techniques for improving communications in the described headend-service unit or point-to-multipoint system. For example,

Dapper teaches payload data being "scrambled with pseudorandom sequences" to "increase randomness" and "prevent[] untoward spectral effects" from "variations in channel activity," and prevent "very high peaks" in the transmitted signals *Id.*, 5:19-26; 42:11-19, 42:41-52. As another example, Binary Phase-Shift Keying ("BPSK") modulation is "preferably used" for the IOC and synchronization channels used for parameters adjustments to "provide robustness in the system." *Id.*, 42:59-65.

2. Hou-Konschak-Dapper Combination

Having implemented OFDM communications into Hou-Konschak's system, a POSITA would have been motivated to incorporate Dapper's teachings on improving OFDM communications through the use of pseudo-random sequences and BPSK modulation. DISH-1003, ¶136. As a result, Hou-Konschak's communications used to measure and adapt channel parameters would have been more robust and been less susceptible to known problems in the art such as spectral effects. DISH-1003, ¶136; DISH-1007, 5:19-26, 42:11-19, 42:41-52, 42:59-65.

Like Dapper, Hou describes that its network operable over "Hybrid Fiber Coax (HFC)" using a headend that receives and delivers signals over the network to cable modems ("CMs") at subscriber residences. DISH-1005, 1:21-38; DISH-1007, 14:15-17, 18:17-56, 19:9-13. Thus, a POSITA would have found that teachings in Dapper would readily be incorporated into Hou. DISH-1003, ¶139.

A POSITA motivated to improve communications in a coaxial or HFC network, as disclosed in Hou-Konschak, would have appreciated that Dapper, like Hou and Konschak, discloses techniques for detecting parameters/characteristics of transmissions from one node to another across a channel in a network and adjusting transmissions based on those parameters/characteristics, optimizing transmissions across that channel. *Id.*, ¶138; DISH-1005, 7:43-8:22, 8:59-62; DISH-1006, 4:45-55, 5:24-30. DISH-1007, 5:11-18, 8:61-9:5. A POSITA would have recognized that Dapper's disclosure of techniques for further optimizing such communications would have been advantageous in Hou-Konschak's system. DISH-1003, ¶138. It would have been apparent to a POSITA of ordinary creativity exercising basic common design sense that there were multiple predictable ways to achieve efficient OFDM communications in Hou-Konschak's network, including through the techniques taught by Dapper. DISH-1003, ¶138. As described below, a POSITA would have been motivated to integrate Dapper's teachings into the Hou-Konschak combination for several reasons.

(a) The Hou-Konschak-Dapper System

The Hou-Konschak-Dapper system would have incorporated known network communication improvement techniques disclosed in Dapper to further improve Hou-Konschak's system. For example, the system would have transmitted the probe packets (the RNG-REQ message) and their payloads (Konschak's reference

symbols) by generating pseudo random time domain samples generated by a pseudo random sequence in order to avoid long sequences of 0s and 1s, thereby increasing the robustness of the transmissions. DISH-1007, 5:22-25, 42:11-15, 42:53-43:8, 43:66-44:12; DISH-1003, ¶¶151-155. The Hou-Konschak-Dapper system would also have transmitted the probe packets with BPSK modulation (for robustness) and a single carrier at the center frequency (to avoid interference with transmissions in adjacent frequency bands). DISH-1007, 42:59-65, 6:21-31, 42:60-65, 49:18-32; DISH-1003, ¶¶157-161. With the reference symbol added to the RNG-REQ message, the MAC layer would also have used the LEN field to provide the length of the packet. DISH-1003, ¶¶164-167; *see also* DISH-1029, 45-46, 64-65.

(b) Motivation

First, the Hou-Konschak combination and Dapper both describe techniques for optimizing communications in point-to-multipoint networks such as HFC and/or coaxial networks. DISH-1005, 5:52-6:6; DISH-1006, [0006]; DISH-1007, 2:37-42. A POSITA would have understood that Dapper discloses known techniques that would have been applied to systems like Hou-Konschak to further the goal of efficient communications in Hou-Konschak's point-to-multipoint network. DISH-1003, ¶139. A POSITA would further have recognized that Dapper's teachings directed to improving OFDM communications in point-to-

multipoint HFC/coaxial networks readily apply to the Hou-Konschak combination network. DISH-1003, ¶139; DISH-1007, 14:8-12 ("The prevent invention is a hybrid fiber/coax video and telephone communication network . . . including optical fiber and coaxial cable distribution systems.").

Second, both Hou-Konschak and Dapper teach improving communications by measuring characteristics of a communication channel in a point-to-multipoint network and adjusting transmission parameters based on those measurements. DISH-1005, 6:37-43, 13:1-3; DISH-1006, [0011]; DISH-1007, 5:11-18, 8:61-9:5. Given these similarities in the references' methodologies, a POSITA would have recognized that the Hou-Konschak network would have benefitted from eliminating or reducing the problems discussed and addressed in Dapper, and would have been motivated to use Dapper's disclosed techniques to address those problems. DISH-1003, ¶140. For example, a POSITA would have recognized the importance of robustness in the signals used for adjustment of parameters like those taught in Hou-Konschak. DISH-1003, ¶141; DISH-1007, 42:59-65. Hou, for example, teaches assigning burst profiles depending on the CMs' robustness levels. DISH-1005, 6:33-35. A POSITA would also have recognized that using pseudorandom sequences to randomize transmitted signals, as was known in the art and taught by Dapper, would prevent unwanted effects in the signals and increase their robustness. DISH-1007, 42:11-19, 42:41-52; DISH-1003, ¶141.

(c) Reasonable Expectation of Success

A POSITA would have had a reasonable expectation that the Hou-Konschak-Dapper combination would produce a successful outcome. DISH-1003, ¶142. This is particularly so because Hou, Konschak, and Dapper[9] are analogous art to the ’539 patent, so a combination of these references would have been predictable. When contemplating Hou-Konschak’s system, a POSITA would have understood that teachings from analogous references like Dapper directed to improved OFDM communications in point-to-multipoint networks would also be

[9] As explained above in Section IV.3(b), Hou and Konschak are both analogous art to the ’539 patent. Dapper is also analogous art to the ’539 patent because Dapper, like Konschak, is reasonably pertinent to the problems that the ’539 patent’s inventors faced—Dapper confronted the issue of adapting transmission parameters based on measured parameters of a channel (in particular adjusting transmission parameters such as frequency based on channel delay information), as did the ’539 patent’s inventors. DISH-1003, ¶¶144; DISH-1001, 9:56-65 (describing “Echo Profile probes” used to “measure node delay spread” in order to “optimize the preamble and cyclic prefix (‘CP’) requirements or other parameters), 10:30-32 (similar); DISH-1007, 9:6-23 (describing adjusting frequency, phase, and timing of transmissions based on calculated delay information).

applicable to Hou-Konschak's system. *Id.*, ¶¶145-146. As discussed above in Section IV.A.3(a), Hou-Konschak would have incorporated Konschak's OFDM transmissions into Hou's point-to-multipoint system. A POSITA would have been able to apply the teachings of Dapper, which is directed to improvements in OFDM transmissions in point-to-multipoint networks, to improve the OFDM transmissions in Hou-Konschak's system by solving problems known to arise in such networks. *Id.*, ¶¶145-146. For example, Dapper teaches scrambling payload data with "pseudorandom sequences" to "prevent untoward spectral effects in the multicarrier signal" from "variations in channel activity" or "highly repetitive data patterns." DISH-1007, 5:19-25. Dapper also teaches that using BPSK modulation would result in greater robustness in network transmissions, and in particular for control or synchronization signals. *Id.*, 37:34-43, 42:63-65. A POSITA would have recognized that using such pseudorandom sequences to scramble payload data would improve Hou-Konschak's OFDM transmissions in the same known way, and implementing such a solution would have been obvious to try. DISH-1003, ¶¶147-148.

As such, the addition of Dapper to Hou-Konschak represents a combination of known elements each performing the functions it had been known to perform to produce the predictable result of improved, more robust OFDM communications. *Id.*, ¶148. A POSITA would have reasonably expected a successful outcome from

combining Dapper's teachings in Hou-Konschak's point-to-multipoint system. *Id.*, ¶148.

3. Claim 2: "The modem of claim 1 wherein the one probe packet has a payload, and the payload includes pseudo random time domain samples generated by a pseudo random sequence."

Hou-Konschak-Dapper renders obvious Claim 2. DISH-1003, ¶149. As shown for claim 1, a POSITA would have found it obvious to use the MAC layer in Hou's CM to implement the claimed "probe packet." *See* Section IV.A.4.[1b] above; DISH-1003, ¶¶105-118, 150.

The '539 patent specification explains that its packets are "scrambled" to randomize the data "with a Pseudorandom Noise (PN23) sequence," which "improves the spectral content of the transmission and reduces any data related DC biases." DISH-1001, 12:20-35. The data is "scrambled again by a PN15 sequence," and the resulting stream is "converted to time domain samples by computing an Inverse Fast Fourier Transform (IFFT)." *Id.*, 13:48-14:10.

Dapper similarly discloses scrambling data with a pseudo random sequence and converting to pseudo random time domain samples. As Dr. Guerin explains, a POSITA would have understood that scrambling data prior to transmission over a network is desirable to avoid long strings of consecutive 0s or 1s, which can be detrimental to communication robustness by, *e.g.*, increasing the odds of

synchronization errors. Dapper similarly discloses that "[d]ata i[n] the payload channels can be scrambled with pseudorandom sequences" to "produce a more balanced multicarrier spectrum." DISH-1007, 5:22-25. "[P]ayload data" and "control data" enter a "scrambler" to randomize the data, which is then "mapp[ed]" to symbols, and the symbols are "mapped into the time domain through the inverse FFT," resulting in "time domain samples." *Id.*, 42:11-15, 42:53-43:8, 43:66-44:9. Both "payload data" and control data are "transformed into time domain samples by the inverse FFT." *Id.*, 44:9-12. This would have included the payload data (i.e., the reference symbol) in the RNG-REQ messages used to adjust transmissions in Hou-Konschak-Dapper's system. DISH-1003, ¶¶152-154. Thus, it would have been known or obvious for the payload transmitted in Hou-Konschak-Dapper's system to have pseudo random time domain samples generated by a pseudo random sequence. *Id.*, ¶¶154-155. The entire payload being made of pseudo random time domain samples generated by a pseudo random sequence, as would result from applying Dapper's teachings to the Hou-Konschak system, satisfies this limitation because the payload would "include" pseudo random time domain samples. *Id.*, ¶155.

Accordingly, Hou-Konschak-Dapper renders obvious "the one probe packet has a payload, and the payload includes pseudo random time domain samples generated by a pseudo random sequence."

4. Claim 3: "The modem of claim 2 wherein the payload is transmitted with a binary phase shift keying (BPSK) modulated single carrier at the center frequency of the channel."

Hou-Konschak-Dapper renders obvious Claim 3. DISH-1003, ¶¶156. Dapper discloses "BPSK" as "the modulation technique preferably used for the upstream and downstream [control] channels and the synchronization channels." DISH-1007, 42:59-65, 6:21-31. Dapper further discloses that "synchronization bands" used to detect parameters between the headend and service units "include a ***single synchronization carrier*** or tone which is ***BPSK modulated***," which "may be located in the ***center of the receive band***.". *Id.*, 49:18-32. A POSITA would have understood that the center of the receive band described in Dapper is the center frequency of the channel because a band is a term for a range of frequencies, and the center of the receive band is the center frequency of the channel. DISH-1003, ¶¶157-160.

It was known in the art that BPSK modulation was desirable in transmissions for maximum robustness. DISH-1003, ¶159; DISH-1007, 42:60-65 (explaining BPSK is the preferred modulation technique to provide robustness in the system); DISH-1034, 5:41-56 (explaining receiving higher modulation such as 8PSK is more difficult than BPSK, and BPSK must be used in noisy environments); 5:57-62 (explaining that modulation type should be dropped from

8PSK to QPSK, then to BPSK as difficulties are encountered with transmissions). It was further known in the art to transmit signals in the center frequency of a band to prevent interference with transmissions in adjacent bands. DISH-1003, ¶160; *see also* DISH-1032, 20 (explaining "there will be no crosstalk from other channels" at the center frequency of the channel); DISH-1033, 24:46-52 (explaining "[t]he impact of the adjacent channel bleed-over can be mitigated" by concentrating signals "toward the center" of the band), Fig. 27 (explaining "center of a channel" will "avoid the roll off of adjacent channels").

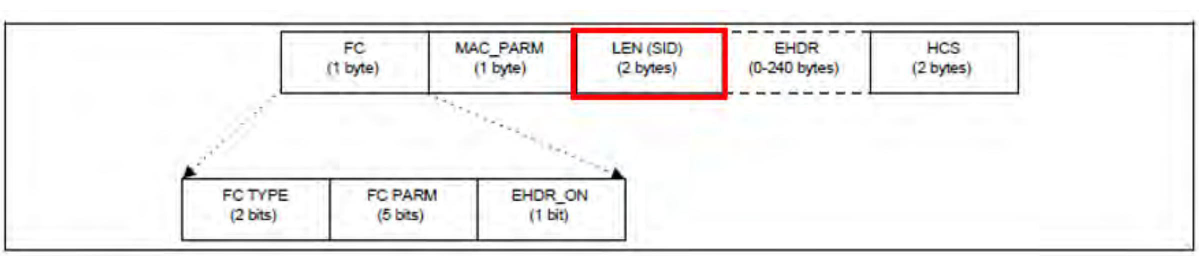
As such, consistent with Dapper's teachings, a POSITA would have been motivated to transmit the payload using BPSK modulation for maximum robustness, and a carrier at the channel's center frequency because it would have minimized possible interference with transmissions on adjacent frequency bands. DISH-1003, ¶161. It would thus have been obvious to a POSITA to have the signal in a BPSK modulated single carrier at the center frequency of the channel. *Id.*, ¶¶156-161.

Accordingly, Hou-Konschak-Dapper renders obvious "the payload is transmitted with a binary phase shift keying (BPSK) modulated single carrier at the center frequency of the channel."

5. Claim 4: "The modem of claim 3 wherein a length of the one probe packet is provided by the MAC layer."

Hou-Konschak-Dapper renders obvious Claim 4. DISH-1003, ¶162. As shown for claim 1, a POSITA would have found it obvious to use the MAC layer in Hou's CM to implement the claimed probe packet to measure the node delay spread and to optimize the preamble and cyclic prefix requirements or other parameters in response to the measured delay spread. DISH-1003, ¶¶103-128; Sections IV.A.4 ([1b]), IV.A.4([1c]).

A POSITA would have further found it obvious to have the MAC layer provide the length of the probe packet. DISH-1003, ¶¶164. In particular, Hou is directed to cable modems operating under the DOCSIS protocol. *See*, *e.g.*, DISH-1005, 4:7-5:51, 6:30-45, 7:25-34. It was known to use standard MAC Header formats in cable network systems utilizing DOCSIS-compliant communications, such as that described in Hou. DISH-1005, 4:8-31. DISH-1029, 45 (depicting a "MAC Header Format"). The DOCSIS standard indicates that the standard MAC Header format included a "LEN (SID)" field.



DISH-1029, Fig. 6-3.

The LEN (SID) field is "[t]he length of the MAC frame," which is "defined

to be the sum of the number of bytes in the extended header (if present) and the number of bytes following the HCS field." *Id.*, 46. The MAC header is passed to the "PMD" (the physical layer used for cable network transmissions), which "transport[s] the MAC frames . . . for upstream channels." *Id.*, 11, 44. It was therefore generally known in the art that packet lengths for transmission over cable networks had lengths provided by the MAC layer as part of a MAC header, and would have found it obvious to implement this functionality in the Hou-Konschak system. DISH-1003, ¶¶164-167.

The DOCSIS specification also specifies that the LEN (SID field) is used as the Service ID instead of the length in the REQ header. DISH-1029, 46 (Table 6-1). The RNG-REQ message is one such REQ message. *Id.*, 64 (showing RNG-REQ message with SID field). And as shown for claim 1, Hou-Konschak's RNG-REQ message that measures the channel delay spread would have included a reference symbol. A POSITA would have understood that the addition of the reference symbol as a payload would have required the use of the LEN(SID) field for the length of the packet. DISH-1003, ¶167. A RNG-REQ message typically has a fixed length thus obviating the need for a LEN field. DISH-1003, ¶167; DISH-1029, 64-65 (describing fixed-length fields of a RNG-REQ message). Adding a payload (Konschak's reference symbol) to the RNG-REQ message would change the length of a regular RNG-REQ message, so the LEN field would

need to be used to specify the length of the packet including the payload. DISH-1003, ¶167. After incorporating Konschak's reference symbol, a POSITA would have modified the RNG-REQ message's MAC header fields to include the length of the probe packet after incorporating Konschak's reference symbol to account for the potentially varying message length. *Id.*, ¶167.

Accordingly, Hou-Konschak-Dapper renders obvious "a length of the one probe packet is provided by the MAC layer."

6. Claim 5: The modem of claim 1 wherein the one probe packet has a payload, and the payload consists of pseudo random time domain samples generated by a pseudo random sequence."

Hou-Konschak-Dapper renders obvious Claim 5. DISH-1003, ¶¶168. Hou-Konschak-Dapper renders obvious probe packets with payloads using a pseudo-random sequence to generate time domain samples. DISH-1003, ¶¶149-155, 169; Section IV.B.3. In particular, in the Hou-Konschak-Dapper system, a pseudo random sequence would have been used to generate pseudo random time domain samples using the reference symbol used as the payload of the extended RNG-REQ packet. DISH-1003, ¶¶149-155, 169. A POSITA would have understood that the payload includes pseudo-random samples (claim 2) or consists of them (claim 5). DISH-1003, ¶¶149-155, 169. As explained above, the entire payload would have been scrambled, which satisfies this limitations. *Id.*, ¶149-155, 169.

Accordingly, Hou-Konschak-Dapper renders obvious "the one probe packet has a payload, and the payload consists of pseudo random time domain samples generated by a pseudo random sequence."

7. Claim 6: "The modem of claim 5 wherein the payload is transmitted with a binary phase shift keying (BPSK) modulated single carrier at the center frequency of the channel."

Hou-Konschak-Dapper renders obvious Claim 6. DISH-1003, ¶¶170; Section IV.B.4.

8. Claim 7: "The modem of claim 6 wherein a length of the one probe packet is provided by the MAC layer."

Hou-Konschak-Dapper renders obvious Claim 7. DISH-1003, ¶¶171; Section IV.A.5.

V. DISCRETION SHOULD NOT PRECLUDE INSTITUTION

A. The *Fintiv* Factors Favor Institution—§314(a)

Institution is consistent with the Director's guidance on applying the *Fintiv* Factors. *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (PTAB Mar. 20, 2020) (precedential) ("*Fintiv*"); *Memorandum: Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation* (June 21, 2022) ("*Director's Guidance*"). A holistic analysis of the *Fintiv* framework favors institution. *Fintiv*, 6.

1. Factor 1: Institution Supports Stays in Parallel Proceedings

Institution would enable the Board to resolve the issue of validity with respect to the ’539 patent, and a finding of invalidity with respect to the patent would relieve the District Court of the need to continue with the companion litigation for this patent. Petitioner will move to stay the District Court case, and the opportunity for such simplification increases the likelihood that the court will grant a stay in view of IPR institution. *C.R. Laurence Co., Inc. v. Frameless Hardware Co., LLC,* 2:21-cv-01334-JWH-RAO (CDCA, Dec. 9, 2022); *Guy A. Shaked Investments, Ltd. et al. v. Trade Box, LLC,* 2:19-cv-10593-AB-MAA (CDCA, Nov. 18, 2020); *Masimo Corp. v. Apple Inc., 8:20-cv-00048-JVS-JDE* (CDCA, Oct. 13, 2020); (all granting motions to stay pending IPRs).

2. Factor 2: The Board’s Final Written Decision Will Likely Issue in Advance of Any Foreseeable Trial

The District Court case was filed on February 10, 2023. And due to delays caused by multiple motions to dismiss including improper venue and failure to state a claim, DISH filed its Answer to the Complaint on September 21, 2023.

The trial date has not been set. Over all civil cases, the median time to trial in CDCA was 28.4 months in the most recent reporting period. DISH-1035 (median time to trial in “CA,C” is 28.4 months). However, the median time to trial for CDCA patent cases in 2023 is 34.4 months. DISH-1037. The anticipated date

of the Final Written Decision ("FWD"), August 2025, would likely be before a median time-estimated trial date in December 2025 (based on 34 months).

Moreover, the Court set the Claim Construction Hearing for September 17, 2024. DISH-1036. It is unlikely that the case would be ready for trial by the estimated June 2025 date, given that a number of key milestones would have to be completed in the nine months following the hearing, such as close of fact discovery, expert discovery, dispositive motions, etc. Regardless, given the filing of this petition before any trial schedule has been set, the District Court may adjust its schedule to ensure a trial date after the estimated date for the FWD.

In sum, the uncertainty of a trial date weighs in favor of institution. And, even if it did not, "the proximity to trial should not alone outweigh" other relevant factors. *Director's Guidance*, 8.

3. Factor 3: Petitioner's Diligence Outweighs the Parties' Investment in the Litigation

The District Court proceeding is in its early states, and the parties' and court's investments have been minimal. Indeed, as discussed above, the court has not resolved whether venue is proper or issued a full schedule. As such, the court has not set a date for trial. Moreover, claim construction briefing is not set to begin until July 2024, which is after the expected issue date of the Institution Decision. DISH-1036.

Patent Owner asserted twelve patents in its complaint. Ten remain after resolution of DISH's motion to dismiss. Further, Patent Owner's September 2023 infringement contentions first disclosed the full list of asserted claims.[10] Despite this late notice of asserted claims, DISH diligently worked to prepare this Petition before its bar date.

DISH's substantial investment in this Petition should counterbalance—and frankly outweigh—the minimal resources invested in the co-pending litigation. It would be unjust to consider resources expended in District Court (equally by both parties), without considering resources expended by DISH to prepare this Petition—effort that would be irretrievably lost without consideration of this Petition on the merits, in addition to the extensive expenses DISH will accrue in the remaining portion of the co-pending litigation.

In sum, this Petition was filed before the one-year statutory bar date and well before any party has made a substantial investment in the district court litigation. *Mylan*, IPR2018-01680, Paper 22 at 18 (finding that petition filed two months before bar date is "well within the timeframe allowed by statute, weighing heavily in [petitioner's] favor"). Petitioner's diligence in filing this Petition soon after first

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[10] Patent Owner's complaint identified just a single claim for each of the multiple asserted patents.

learning the full set of asserted claims and at an early stage of the companion litigation weighs in favor of institution. *See, e.g.*, *Apple Inc. v. Seven Networks LLC*, IPR2020-00156, Paper 10 at 11-12 (PTAB Jun. 15, 2020); *Sotera*, 16-17.

4. Factor 4: The Petition Raises Unique Issues

DISH asks the Board to consider the unique challenges raised in the Petition. *See Fintiv*, 12-13. If the Board institutes the pending Petition, DISH will not pursue district court invalidity challenges based on the same grounds in this petition pursuant to 35 U.S.C. § 315(e), thereby eliminating any risk of duplicated effort between the District Court proceeding and the IPR. *Sand Revolution II, LLC v. Cont'l Intermodal Group-Trucking LLC*, IPR2019-01393, Paper 24 at 12 (PTAB June 16, 2020).

5. Factor 5: DISH's Involvement in Parallel Proceedings

The parties are the same in this IPR and in the parallel District Court proceeding.

6. Factor 6: The Merits Support Institution

As *Fintiv* noted, "the factors … are part of a balanced assessment of all the relevant circumstances in the case," and, "if the merits of a ground raised in the petition seem particularly strong…the institution of a trial may serve the interest of overall system efficiency and integrity…." *Fintiv*, 14-15. As explained in the

Petition (with expert testimony from Dr. Guerin), the grounds raised herein are strong, and institution would result in invalidation of the Challenged Claims.

B. The *Advanced Bionics* Test Favors Institution—§ 325(d)

Hou, Konschak, and Dapper were not considered or cited during prosecution of the ’539 patent, and consequently, each is being considered for the first time in this IPR proceeding. Thus, none of Grounds 1-3 involve the same or substantially the same prior art or arguments previously presented to the Office.

Accordingly, neither condition of the first prong of the *Advanced Bionics* framework is met, and there is no need to reach the second prong to resolve against discretionary denial under § 325(d). *See, e.g., Oticon Medical AB et. al. v. Cochlear Ltd.*, IPR2019-00975, Paper 15 at 20 (PTAB Oct. 16, 2019) (precedential) (“There is new, noncumulative prior art asserted in the Petition…[f]or at least this reason, we determine not to exercise our discretion under § 325(d)”). To the extent the second factor is considered, the Examiner erred by failing to consider, or identify during a search, relevant references, such as Hou, Konschak, Dapper, and Roeck. Thus, discretionary denial under § 325(d) is not warranted.

VI. FEES—37 C.F.R. §42.103

Petitioner authorizes the USPTO to charge Deposit Account No. 06-1050 for the fee set in 37 C.F.R. § 42.15(a) for this Petition and authorizes payment for any

additional fees to be charged to this Account.

VII. CONCLUSION

Petitioner respectfully requests institution of an IPR and cancellation of all Challenged Claims.

VIII. MANDATORY NOTICES—37 C.F.R §42.8(a)(1)

A. Real Party-In-Interest—37 C.F.R. §42.8(b)(1)

Petitioners, Dish Network L.L.C., Dish Network Service L.L.C., DISH Network Corporation, and DISH Network California Service Corporation, are the real parties-in-interest. No other party had access to or control over the filing of this Petition, and Petitioner did not file this Petition for the benefit of any other party or entity.

B. Related Matters—37 C.F.R. §42.8(b)(2)

Petitioner is not aware of any disclaimers, reexamination certificates, or petitions for *inter partes* review for the ’539 patent.

Petitioner is aware of the following civil actions involving the subject matter for the ’539 patent.

Case Number	Filing Date
Entropic Communications, LLC v. DirecTV, LLC f/k/a DirecTV, Inc. et al., 2-23-cv-05253 (CDCA)	July 1, 2023
Entropic Communications, LLC v. DISH Network Corporation et al., 2-23-cv-01043 (CDCA)	February 10, 2023

Case Number	Filing Date
Entropic Communications, LLC v. Cox Communications, Inc. et al., 2-23-cv-01047 (CDCA)	February 10, 2023
Entropic Communications, LLC v. Comcast Corporation et al., 2-23-cv-01048 (CDCA)	February 10, 2023
Entropic Communications, LLC v. Charter Communications, Inc., 2-23-cv-00050 (EDTX)	February 10, 2023
Entropic Communications, Inc. v. ViXS Systems, Inc. et al., 3-13-cv-01102 (SDCA)	May 8, 2023

C. Lead And Back-Up Counsel Under 37 C.F.R. § 42.8(b)(3)

Petitioner provides the following designation of counsel.

Lead Counsel	Backup counsel
Adam R. Shartzer, Reg. No. 57,264 Fish & Richardson P.C. 60 South Sixth Street Minneapolis, MN 55402 Tel: 202-783-5070 Fax: 877-769-7945 Email: IPR45035-0032IP1@fr.com	Ruffin B. Cordell, Reg. No. 33,487 Ashley A. Bolt, *pro hac vice* forthcoming Wonjoon Chung, *pro hac vice* forthcoming Tyler R. Train, Reg. No. 76,108 Vivian C. Keller, Reg. No. 79,387 Timothy Riffe, Reg. No. 43,881 Usman Khan, Reg. No. 70,439 Fish & Richardson P.C. 60 South Sixth Street Minneapolis, MN 55402 Tel: 202-783-5070 Fax: 877-769-7945 IPR45035-0032IP1@fr.com

D. Service Information

Please address all correspondence and service to the address listed above.

Petitioner consents to electronic service by email at IPR45035-0032IP1@fr.com.

Respectfully submitted,

Dated: February 5, 2024

/Adam R. Shartzer/
Adam R. Shartzer, Reg. No. 57,264
Fish & Richardson P.C.
60 South Sixth Street
Suite 3200
Minneapolis, MN 55402
T: 202-783-5070
F: 877-769-7945

(Control No. IPR2024-00546)

Attorneys for Petitioner

CERTIFICATION UNDER 37 CFR § 42.24

Under the provisions of 37 CFR § 42.24(d), the undersigned hereby certifies that the word count for the foregoing Petition for *Inter partes* Review totals 13,237 words, which is less than the 14,000 allowed under 37 CFR § 42.24.

Dated: February 5, 2024

/Adam R. Shartzer/
Adam R. Shartzer, Reg. No. 57,264
Fish & Richardson P.C.
60 South Sixth Street
Suite 3200
Minneapolis, MN 55402
T: 202-783-5070
F: 877-769-7945

Attorney for Petitioner

CERTIFICATE OF SERVICE

Pursuant to 37 CFR §§ 42.6(e)(4)(i) *et seq.* and 42.105(b), the undersigned certifies that on February 5, 2024, a complete and entire copy of this Petition for *Inter partes* Review, Power of Attorney, and all supporting exhibits were provided via Federal Express, to the Patent Owner by serving the correspondence address of record as follows:

MCANDREWS HELD & MALLOY, LTD
500 WEST MADISON STREET
SUITE 3400
CHICAGO, IL 60661
UNITED STATES
(312) 775-8000

/Crena Pacheco/
Crena Pacheco
Fish & Richardson P.C.
60 South Sixth Street
Minneapolis, MN 55402
pacheco@fr.com